The Model Sustainable Development of Cassava Production System in Bolikhamxay Province, Lao People's Democratic Republic
รูปแบบการพัฒนาอย่างยั่งยืนของการผลิตมันสำปะหลังแขวงบอลิคำไซ สาธารณรัฐประชาธิปไตยประชาชนลาว

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บทคัดย่อ

การวิจัยครั้งนี้มีวัตถุประสงค์เพื่อศึกษาปัจจัยที่มีอิทธิพลต่อความยั่งยืนของระบบการผลิตมันสำปะหลังและเพื่อสร้างรูปแบบระบบการผลิตมันสำปะหลังเพื่อการพัฒนาที่ยั่งยืน โดยใช้วิธีวิจัยแบบผสมผสาน ได้แก่ การวิจัยเชิงปริมาณ ศึกษาปัจจัยที่มีอิทธิพลต่อความยั่งยืนของระบบการผลิตมันสำปะหลัง นำแนวคิดเกี่ยวกับระบบการผลิตและการปลูกพืชมันสำปะหลังและทฤษฎีระบบ อธิบายถึงปัจจัยที่ส่งผลต่อระบบผลิตมันสำปะหลังและเป็นตัวแปรที่ศึกษา ผู้ให้ข้อมูลสำคัญเป็นผู้ผลิตมันสำปะหลัง จำนวน 353 คน เก็บข้อมูลด้วยแบบสอบถาม ใช้สถิติวิเคราะห์การถดถอยพหุคูณแบบปกติ จากนั้นนำผลศึกษามาสร้างรูปแบบโดยใช้วิธีการวิจัยเชิงคุณภาพ อธิบายด้วยทฤษฎีการพัฒนาที่ยั่งยืนและทฤษฎีการพัฒนาการเกษตรอย่างยั่งยืน กลุ่มเป้าหมายจำนวน 35 คน ด้วยการสัมภาษณ์กลุ่ม วิเคราะห์ข้อมูลโดยใช้สถิติเชิงพรรณนา ได้แก่ ค่าเฉลี่ย ส่วนเบี่ยงเบนมาตรฐาน และความถี่ ผลการวิจัยพบว่า ปัจจัยที่มีอิทธิพลต่อความยั่งยืนของระบบการผลิตมันสำปะหลังแขวงบอลิคำไซทั้งหมดอย่างมีนัยสำคัญทางสถิติที่ระดับ .01 ปัจจัยที่มีอิทธิพลสูงสุดได้แก่ ปัจจัยด้านสถาบัน X3 (In) ตามด้วยปัจจัยการจัดการ X2 (Ma) ปัจจัยการมีส่วนร่วม / สหกรณ์ (Pa) X4 และปัจจัยทางกายภาพ X1 (ph) ตามลำดับ (t = 6.63, 3.12, 2.75 และ 2.75 ตามลำดับ) และรูปแบบระบบการผลิตมันสำปะหลังเพื่อการพัฒนาที่ยั่งยืนแขวงบอลิคำไซ 4 ด้าน รวม 17 กิจกรรม ได้แก่ 1) การพัฒนาสังคมและวัฒนธรรมสำหรับกลุ่มการผลิตมันสำปะหลัง 2) การพัฒนาเศรษฐกิจ 3) การพัฒนาทรัพยากรธรรมชาติและสิ่งแวดล้อมสำหรับกลุ่มการผลิตมันสำปะหลัง 4) การพัฒนาความแข็งแกร่งของกลุ่มสำหรับการผลิตมันสำปะหลัง

คำสำคัญ : รูปแบบการพัฒนาอย่างยั่งยืน ; การผลิตมันสำปะหลัง ; แขวงบอลิคำไซสาธารณรัฐประชาธิปไตยประชาชนลาว ; การพัฒนาที่ยั่งยืน ; มันสำปะหลัง

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ABSTACT

The purposes of this research were: to study factors influencing to sustainability of cassava production system in Bolikhamxay Province by applying mix-methods including quantitative and qualitative approaches. Quantitative method applies 353 surveys, which examine factors influencing to the sustainability of the cassava production system. Such quantitative examination applies concepts related to cassava production and cropping systems with the applications of system theory that can be used as an explanation for factors effecting to cassava production and as studied variables. The quantitative analysis applies normal multiple regression and then using such calculated results for designing qualitative method. Such qualitative exploration is explained by theory of sustainable development and agricultural sustainable development with 35 informants who participated in focus group. The qualitative analysis applies descriptive statistics including means, standard deviation and frequency. The results of the research as follows: factors that influence the sustainability of cassava production system reveal a significant rate at .01. The factors that influenced the institutional X3 (In) followed by management factors X2 (Ma), participation,/ cooperative factors (Pa) X4 and physical factors X1 (ph) respectively (t = 6.63, 3.12, 2.75), and 2.75 respectively and model for sustainable development in Borikhamxay Province, Lao PDR. This research can be summarized in four aspects consisting of seventeen activities: 1) social and cultural development for cassava production groups 2) economic development 3) development of natural resources and the environment for cassava production groups 4) strength's development for groups for production.

Keywords : The Model Sustainable Development ; Cassava Production ; Bolikhamxay Province, Lao PDR ; Sustainable Development ; Cassava

Introduction

Sustainable development to cities has been the main stream of urban development over the past decade. Many cities and organizations have the concept of urban development in many different ways, but the same goal is Livability and sustainability. The sustainable urban development must consider the balanced development in 3 main components which are economy, society and environment. By focusing on developing strong communities to be the foundation of society Creating an environment for good quality of life and the development of a strong economic foundation for self-reliance (Hemker, 2019)

Lao's People Democratic Republic is a land lock country and located in the central of Indochina. It shares borders with its five neighboring countries, and has the total areas of 236,800 square Kilometers (APPF, 2009). Around 80% of the country is mountainous area while the rest is lowland area. The forest covers 81.3% of total land area with 10.3% of agriculture area, 6.6 % of Arable Land and 1.8% for other areas (World Bank 2015). Most of the population is engaged in agriculture as their main occupation, the top crops in Laos are rice, vegetables, beans, sugarcane, cassava, tobacco, cotton, sugarcane, coffee, animal raising are cattle, pigs, goats, chickens and ducks.

In terms of total cash crops production in Lao, cassava or tapioca (Manihotesculenta, Crantz) has now become the second most important crops, after rice. It is likely proved more profitable. It has also changed from being primarily a food crop to becoming an industrial crop with multiple uses, including an animal feed, a sweetener and processed food, and for ethanol production. The majority of the cassava planted areas are steadily enlarging whole country as indicated by the government statistics, in 2013 the total planted area was 45,185 ha with averaged annually cassava yield 1.25 million tons, and counting for 23.41 t ha-1 (MAF, 2013), indicated in Vientiane capital and Bolikhamxay provinces, both are contain large

planted of cassava 10,610 ha and 9,615 ha respectively. However, Bolikhamxay province is mostly representative of cassava production diversification with there are two type of market option for cassava products, fresh root starch and transform to dried chip product. Mostly farmer sell their cassava products to a middleman then pass to transform factories or other exporter companies which is a key destination pot of the cassava product. The crop also has become an important source of cash income for household in rural area of Lao. However, immediate gains of income may be short-lived and may lead to longer-term poverty unless production systems are properly managed. Due to the price that farmers obtain may not be enough for them to purchase fertilizers to replace nutrients used. In addition, many farmers are not aware of the need to properly manage soils fertility to ensure sustainable production. After a few years of cash cropping without adequate inputs, yields begin to decline, fields are abandoned and, where available or new forested lands are cleared for production (Vientiane Times, 2008).Moreover, the large scale of marketing systems is more facing troubles from unstable price of domestic market; due to there is indefinite rule for private sectors and other extension companies in to organize the price structure of product and the systems function. Thus, it could be concluded that the farming system of cassava production is to be un-sustainability production system and more risk with three aspects of economic, environment and social. To improving the issue of market price and exploiting, last few years the Lao government has try to establish the cassava association by participatory of farmer groups, private companies and government sectors.

Therefore, to meet the goal of the national policy and to ensure the ultimate development goal of graduation the country from status to least developed countries, more reliable data is needed and our study intends to identification influencing factors on sustainability of cassava production and indicated the appropriate model for sustainable cassava production in Bolikhamxay province, Lao PDR. These findings might be initially used as appropriate information for further development in order to give some recommendation to government decision makings policy suggestion for cassava production system in Lao.

Objective

1. To study cassava production systems and identify factors influencing to sustainability of cassava production system in Bolikhamxay province, Lao PDR.

2. To determine the model of sustainable development cassava production system in Bolikhamxay province, Lao PDR.

Literature Review

Based on the topic and objectives of the study are emphasized with categorized documents as bellow:

Production systems and cassava cash crop

This study is focusing on production systems it is appropriate to also explain the meaning of production. Moreover, a more thorough analysis and description of production systems is needed, which is provided here through descriptions of the components of the production system, its relations and hierarchical nature. The process of creating goods and/or services through a combination of material, work, and capital is called production. Production can be anything from production of consumer goods, service production in a consultancy company, music or energy production. Thus, there is a clear connection between production of goods and services. Consumption constitutes the superior driving force for all production. Produced goods must in some way be distributed for consumption. However, the specific type of production referred to in this study is agricultural production. Which is covered the cultivation and breeding of

animals, plants and transform processing of agriculture products and Similarly as mention above, in Lao; Cassava known as "Man Ton" is considered as one of the most important cash crops for smallholder farmers, the production of cassava has steadily increased during the year 2009s and 2013s through expansion of the planted area with an average owned cassava cultivated land 1-3,5 ha, average yield estimates range from 10 to 25 t ha^1 respectively depend on farmer' labor force. Almost of farmers grow cassava continuously on the same field by mono-cropping to a shift cultivated; they use different type of cassava varieties, which are most imported from neighboring countries. Farmers are plant cassava stem cutting method around 25 cm high with the planting space between 50-70 cm with applied little or no organic and inorganic amendments to the cassava field. There were two categories of cassava cropping; one is transforming to dried chips and fresh root selling. Cassava is likely proved more profitable for Lao farmers. It has also changed from being primarily a food crop to becoming an industrial crop with multiple uses, including an animal feed, a sweetener and processed food, and for ethanol production. The crop also has become an important source of cash income for household in rural area of Lao. However, immediate gains of income may be short-lived and may lead to longer-term poverty unless production systems are properly managed. Due to the price that farmers obtain may not be enough for them to purchase fertilizers to replace nutrients used. In addition, many farmers are not aware of the need to properly manage soils fertility to ensure sustainable production. After a few years of cash cropping without adequate inputs, yields begin to decline, fields are abandoned and, where available or new forested lands are cleared for production. Thus, the price and marketing system is still it considered as primarily serious problem for sustainability of cassava production in Lao. (Arthey, Srisompun and Zimmer, 2018)

System Theory and Concept

system is delineated by its spatial and temporal boundaries, some systems may consist of subsystems which are a system object that contains information defining the characteristic of an operating environment controlled by the system; a subsystem is a set of elements, which is a system itself, and also a component of a larger system. Functional ; the systems' behavior is described in term of its interaction with the environment. Beside that the function system of individual components are interactive each elements by the Energy (E), Material (M), Information (I).Therefore, a system theory is considered as the trans disciplinary study of the abstract organization of phenomena, independent of their substance, type, or spatial or temporal scale of existence. It investigates both the principles common to all complex entities, and the models which can be used to describe them. A system can be said to consist of four things. Several system characteristics are: wholeness and interdependence, correlations, perceiving causes, chain of influence, hierarchy, and subsystems, self-regulation and control, goal-oriented, interchange with the environment, inputs/outputs, the need for balance/homeostasis, change and adaptability (morphogenesis) and equifinality: there are various ways to achieve goals. Different types of networks are: line, commune, hierarchy and dictator networks communication in this perspective can be seen as an integrated process not as an isolated event. Sustainable development theory (Hubka and Eder, 1988)

Sustainable Development Theory and Concept

the concept of sustainable development is more usefully at the confluence of three constituent parts in term development country as well as the Lao government has been trying to adopted this perception for their policy plan especially agricultural aspect. Therefore, on this study of sustainable development is emphasized on the three equally dimension of economic, environmental and social. Although

many definitions abound, the most often used definition of sustainable development is that proposed by the Brundtland Commission. This broad definition, which will be used in this dissertation, does not limit the scope of sustainability. The explanation does, however, touch on the importance of intergenerational equity. This concept of conserving resources for future generations is one of the major features that distinguish sustainable development policy from traditional environmental policy, which also seeks to internalize the externalities of environmental degradation. The overall goal of sustainable development is the long-term stability of the economy and environment; this is only achievable through the integration and acknowledgement of economic, environmental, and social concerns throughout the decision-making process. Moreover, there has generally been recognition of three aspects of sustainable development (Shi, Han, Yang and Gao, 2019)

1. Economic: An economically sustainable system must be able to produce goods and services on a continuing basis, to maintain manageable levels of government and external debt, and to avoid extreme sectoral imbalances which damage agricultural or Industrial production.

2. Environmental: An environmentally sustainable system must maintain a stable resource base, avoiding over- exploitation of renewable resource systems or environmental sink functions, and depleting non-renewable resources only to the extent that investment is made in adequate substitutes. This includes maintenance of biodiversity, atmospheric stability, and other ecosystem functions not ordinarily classed as economic resources.

3. Social: A socially sustainable system must achieve distributional equity, adequate provision of social services including health and education, gender equity, and political accountability and participation

As a result of the concept of sustainable development is more usefully at the confluence of three constituent parts (figure1) in term development country as well as the Lao government has been trying to adopted this perception for their policy plan especially agricultural aspect. Therefore, on this study of sustainable development is emphasized on the three equally dimension of economic, environmental and social.

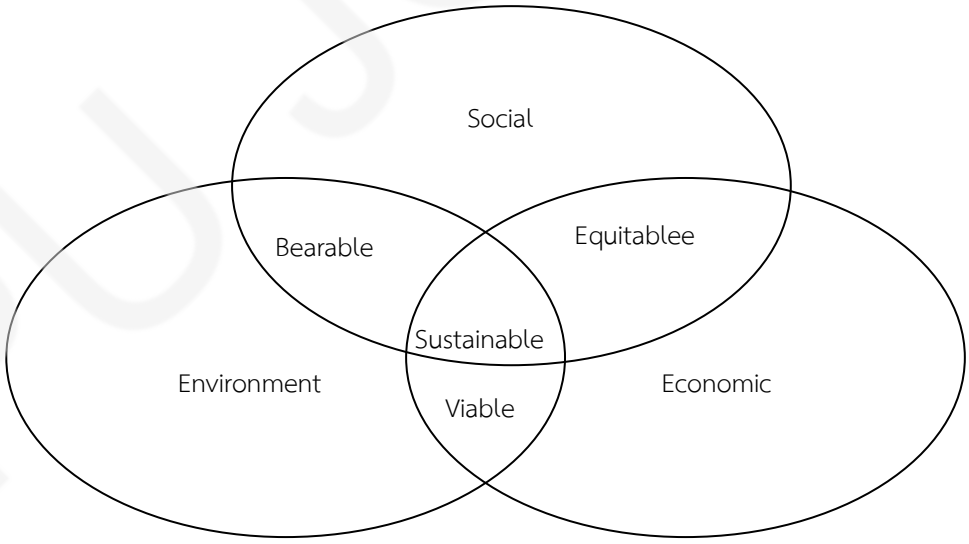

Figure 1 Concept of sustainable (Klarin, 2018)

Concept and Sustainable Agricultural Development

In relation to the social and economic aspects of sustainable development, a cooperative present an important factor, which can address the problem of the social exclusion of the poor or rural farmers and disadvantage who lack access to opportunities in a liberalized market economy Moreover, cooperative encourage local participation and inclusion which is central to poverty reduction. This has been reflected in UN guidelines, related to cooperative in social development, by Bibby and Shaw (2005) from this discussion it can be noted that cooperative represent a powerful development strategy, which can enhance the competitiveness of small-scale farmer and address market failure therefor in the term of sustainability of cassava production system are needed. As a result of these might be initiatively for this cash crop product in stabling the environmental with also economic and social concern. Therefore, increasing of potentials cassava production sustainability in Lao will certainly be involved various approaches. Some of study which may require addition improving high yielding varieties, improved growing technique crop management practices and the intensive production with high input of fertilizers application. However, the main factors could be category as physical, biophysical, management practice, socio-economic, institutional policy and another factor. Among those might be correlation in each variable factor to cassava production. (Birchall, 2004)

Conceptual Framework

Based on guideline objectives of the study and the conceptual framework for this study is shown in figure as below.

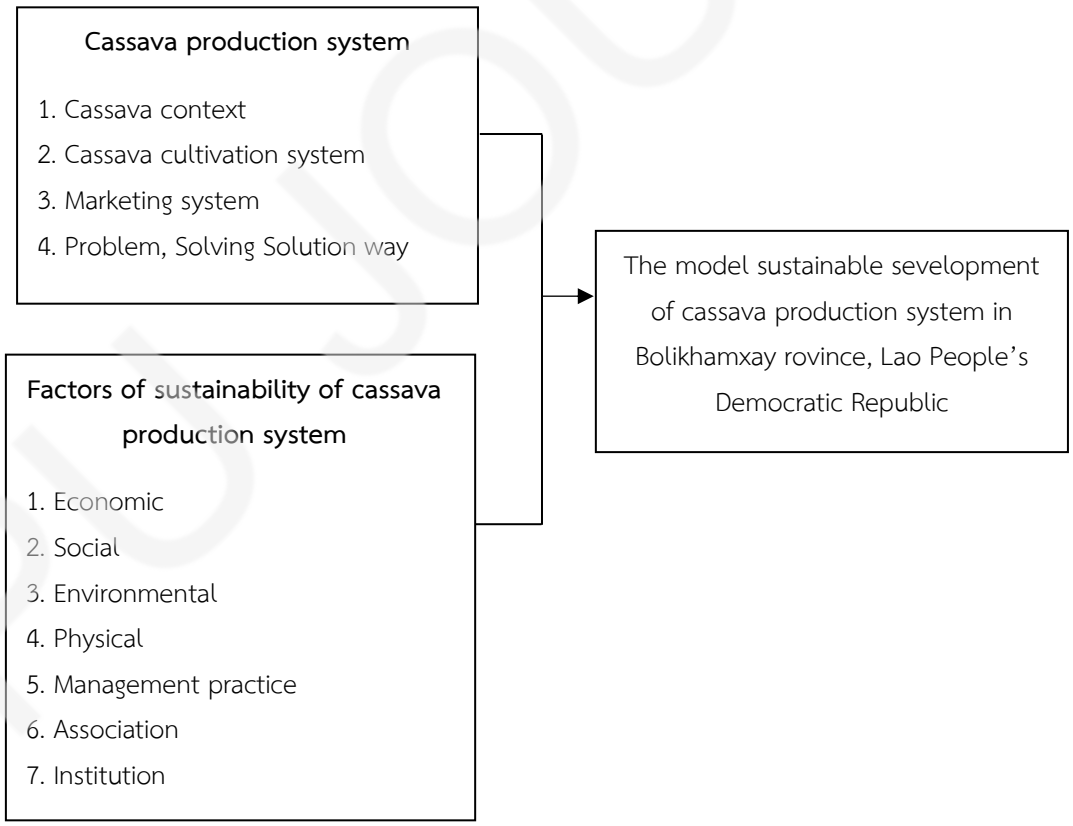

Figure 2 Conceptual framework

Research Methodology

Population and Samples

There are designed to use mixed methods with both of quantitative and qualitative methods. Based on the objectives to study identify factors influencing to sustainability of cassava production system in Bolikhamxay province, Lao PDR and to determine the model of sustainable development cassava production system in Bolikhamxay province, Lao PDR. of this study divided into two mains: to study identify factors influencing to sustainability of cassava production system in Bolikhamxay province, Lao PDR.

Borikhamxay province consist of 5 Districts namely Thaphabath, Paksan, Bolikhan, khamkert, Viengthong Districts, based on the multi condition associated with cassava cultivation. This research will be conducted in Bolikhan District for study site. Bolikhan District is cover 43 villages, to select the representative villages were classify by large planted area combine with high number of household' growing cassava, thus, based on the secondary statistical data and confirmed preliminary survey from the village leaders.

Sample Selection and Data Collection Procedure

Population and Samples were 353 peoples calculated by Yamane. From total of 3,012 households' growing the cassava from 43 villages in Bolikhan District, Borlikhamxay province, Lao PDR. With head of household or the household representative and to determine the model of sustainable development cassava production system in Bolikhamxay province, Lao PDR. Target group are the Key Informant total of 35 peoples. with consisting of farmer sample 12 peoples, village leader 12 peoples, agriculture staff 2 peoples, District Agriculture Forestry Officer / Provincial Agriculture Forestry Officer level 2 peoples, District Industry and Commerce Officer/ Province Industry and Commerce Officer 2 peoples, middlemen/ Company 2 peoples, experts 3 peoples.

Research Instruments

Research Instruments are questionnaires interview by the rating scale of each topic classify and prepared by the researcher with IOC checking. Then Identify factors were define as Y =Dependent variable (sustainable of cassava production system) are consisting of Y1=Social (So), Y2 =Economic (Eo) and Y3 = Environmental (En) with four main dimension of X = Independent or predictor variable, consist of X1 = Physical (ph) factor, X2 = Management (Ma) factor, X3 = Institutional (In) factor and X4 = Participation /cooperative (Pa) factor respectively and to determine the model of sustainable development cassava production system in Bolikhamxay province, Lao PDR. Target group are the Key Informant total of 35 peoples. with consisting of farmer sample 12 peoples, village leader 12 peoples, agriculture staff 2 peoples, District Agriculture Forestry Officer / Provincial Agriculture Forestry Officer level 2 peoples, District Industry and Commerce Officer/ Province Industry and Commerce Officer 2 peoples, middlemen/ Company 2 peoples, experts 3 peoples.

Data Collection

Data collection 1) Prepare request letter of cooperation, 2) Submit the request letter to the heads of the villages of the samples and ask for kind help granting the access to collect the data, 3) The data collection was carried out by the researcher assistants. Collect the data through the questionnaires (ask/interview the head of household and fill the questionnaires) and 4) check the accuracy of the responses in the questionnaires. Code the collected questionnaires according to the coding book and ready for further processing

Data Analysis

Data Analysis was used the quantitative analyses in analysing by statistical of means, standard deviation and frequency. The questionnaire answers were coded and encoded processed in the computer using MS Excel and statistics program (SPSS and LISREL) with enter multiple regression analysis and Content analysis with synthesis computed through by using content analysis descriptive statistics and inference statistics.

Results and Discussion

1. Factor influencing to sustainability of cassava production system in Bolikhamxay province, general form of multiple regression models within unstandardized value and the combinations of explanatory variables show the important independent variables which is included given. Institutional (In), Management (Ma), Participation/cooperative (Pa) and Physical (ph) were mainly factors respectively. The validity value of variable factors and testing the statistical significance of significance validity values by using t-test values and creating predictive equations as shown in Table

Table 1 The value of all variables factor by enter multiples regression for influencing factors to sustainable of cassava production system in Bolikhamxay Province, Lao People's Democratic Republic

Step of variables factors	b	SE_b	β	t	Significant
1. Physical (ph) factor	.06	.02	.10	2.45**	.01
2. Management (Ma) factor	.19	.06	.19	3.12**	.00
3. Institutional (In) factor	.32	.04	.41	6.63**	.00
4. Participation/cooperative (Pa) factor	.13	.04	.18	2.75**	.00
R = .80	R^2 = .64		F = 158.54**		
SE_{est} = .64	a = 1.10				

** = Significant $\leq$ 0.01

* = Significant $\leq$ 0.05 respectively

Based on Table the weight value importance variables of cassava production system factors affecting sustainability in Bolikhamxay Province, Lao People's Democratic Republic Statistical significance at the level of P $\leq$ 0.01 in term of Institutional (In) variable factor has the most predictive weight value, follow that Management (Ma), Participation / cooperative (Pa) factor and Physical (ph) factor. In addition, the regression coefficients (b) in unstandardized values of X1 Physical (ph), Management (Ma), Institutional (In) and Participation/ cooperative (Pa) factor were showed the values of .06, .19, .32 and .13 respectively. However, the regression coefficients (β) in standardized values also showed the values of .10, .19, .41 and .18 respectively. With multiple correlation coefficient R = .80, and explanatory power predictive with 64.64% (R-Square = .64, Standard Error = 4.46 and constant intercept = 1.10

Factor influencing to sustainability of cassava production system in Bolikhamxay province, general form of multiple regression models within unstandardized value and the combinations of explanatory variables show the important independent variables which is included given. Institutional (In), Management (Ma), Participation/cooperative (Pa) and Physical (ph) were mainly factors respectively

The findings showed that: factor influencing to sustainability of cassava production system in Bolikhamxay province, general form of multiple regression models within unstandardized value and the

combinations of explanatory variables show the important independent variables which is included given. Institutional (In), Management (Ma), Participation/cooperative (Pa) and Physical (ph) were mainly factors respectively. Consistent with the research of Ahimbisibwe and Peter (2018) research on impact of cassava innovations on household productivity and welfare in Uganda. PhD thesis, University of Greenwich. Agriculture remains the mainstay of Uganda's economy, employing its majority population and contributing significantly to its GDP. Cassava is a national priority crop for Uganda and remains a globally competitive source of food, nutrition and income security as well as an industrial commodity due to its unique attributes. However, its productivity remains inadequate due to low technology uptake, dysfunctional seed systems, poor farmer organisation and policy failures. Motivated by several problematized research gaps, this study carried out an empirical investigation to answer seven research questions: (a) what are the causal determinants of participation in cassava Agricultural Innovation System (AIS) initiatives? (b) what is the impact of participation in cassava AIS interventions on cassava productivity and household welfare? (c) what are the causal factors influencing the choice of cassava seed access sources? (d) what are the determinants of cassava technology adoption? (e) what is the impact of improved-uncertified cassava seed adoption on cassava productivity and household welfare? (f) what is the impact of improved-certified cassava seed adoption on cassava productivity and household welfare (g) do different impact estimation strategies yield consistent impact estimates? This study used cassava stem and root yield as measures of productivity while household welfare was measured using cassava cash income and household total consumption expenditure both adjusted to per capita levels using Adult Equivalent Units. The results indicate that educated households and those that belong to other forms of farmer groups were more likely to join AIS initiatives than their less educated counterparts and those that do not belong to other groups. Propensity Score Matching results reveal that participation in AIS initiatives enhances cassava productivity and household welfare outcomes. Agricultural Innovation Platform (AIP) members were more likely to adopt production enhancing inputs such as improved certified seed. Promotion of AIS approaches is advised. Farmer perceptions about the use of improved certified seed and seed sources, household decision-making and input access shocks influence farmers' choice of a given seed source. It is recommended that both state and non-state actors should fund decentralized cassava seed multiplication centers. AIP membership, access to extension services, land size, education, family size, and age of the household head are some of the causal determinants of adoption and adoption intensity of cassava technologies. The study also obtained consistent results from Ordinary Least Squares, PSM and Endogenous Switching Regression that use of improved certified cassava seed is productivity- and welfare-enhancing. Finally, the study has contributed to knowledge by providing one of the first sets of empirical evidence to support spousal roles in household decision-making, use of AIS concepts in technology promotion, importance of seed inspection and certification programmer in Uganda. The study has also contributed to the knowledge and literature on impact of agricultural technology adoption by extending robust methodologies to the previously neglected but all-important cassava commodity. Consistent with the research of Thong-on (2016) Increasing Cassava Yield by Research Knowledge Synthesis, Community Communication, and Geographic Information Systems in Kamphaeng Phet Consistent with the research of Province Areas. Factors that increase cassava production are Knowledge given to farmers in the process of cassava production, varieties and selection of keys, cultivation methods and planting planning, soil maintenance and soil preparation, use, weeding, use Fertilizer and proper harvesting Including the main factors related to cassava planting, namely soil Water and communication with the community.

2. Determination of model of sustainable development cassava production system in Bolikhamxay province, Lao PDR, there are summarized into 4 aspects with total of 17 activities. 1) social and cultural

development for cassava production group, 2) Economic development for cassava production group, 3) Natural resources and environmental development for cassava production group and 4) Group strength development for cassava production group. The most appropriate model is a social and cultural development for cassava production group which is indicated that the validity and feasibility were passed the criteria with led high value

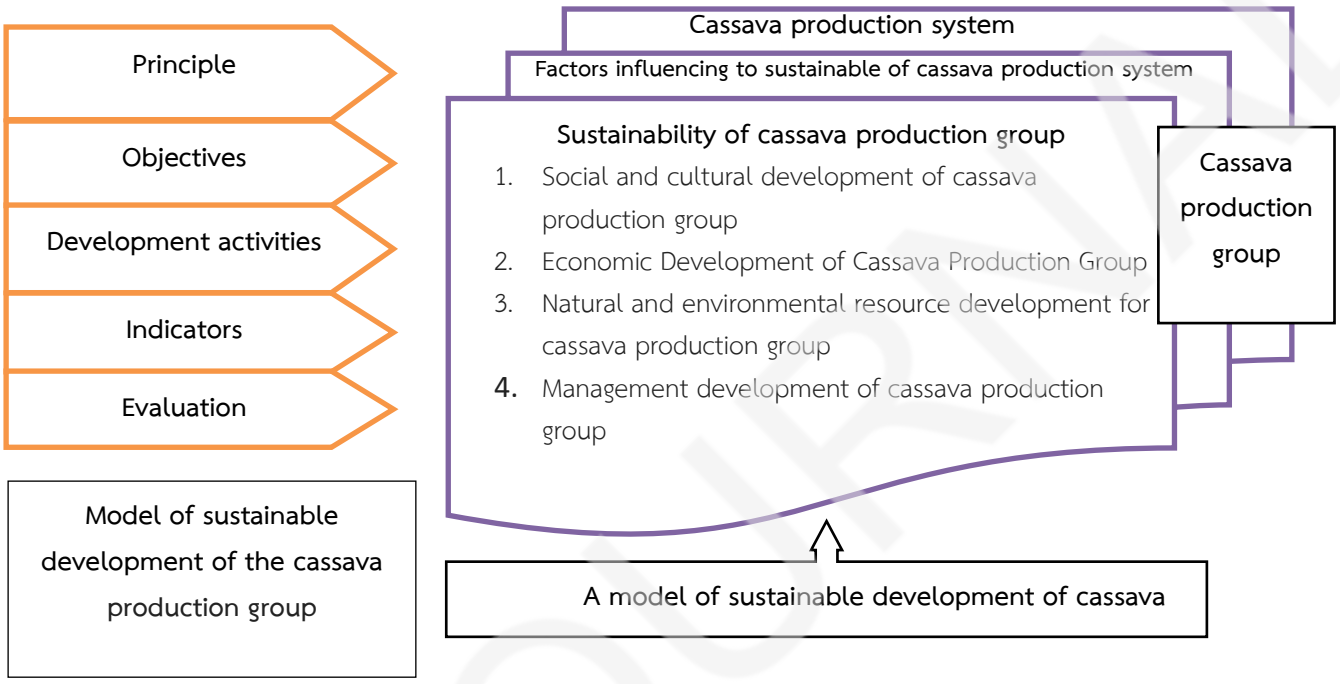

Figure 3 Summary of main important models of sustainable development of the cassava production group

According to the results of identifying the factor influencing to sustainable development cassava production system in Bolikhamxay province, Lao PDR. Were emphasized on the three dimensions of sustainable. In addition, in term of external factors which is mainly focusing on the organization, policy and other that effected to the system of cassava research were included by group into primarily factors. Therefore, the models of sustainable development of cassava production system in Bolikhamxay province, Lao PDR are distributed into four categories 1. Social and cultural development for cassava production group 2. Economic development for cassava production group 3. Natural resources and environmental development for cassava production group and 4. Group strength development for cassava production group. Consistent with the research of Kiatsewee, Dilokwutthisit and Thadaniti (2020) A Model of coastal fisheries resources sustainable development in Koh Sichang district, Chonburi province. The purposes of this research were to: 1) study factors of coastal fishery resources development and 2) develop and evaluate a model of coastal fishery resources development. This study used mixed methods of quantitative research and qualitative research. The sample used for quantitative research was comprised of 400 fishermen, obtained by proportional stratified random sampling. The tool used for data collection was a questionnaire. The statistics used for data analysis were frequency, percentage, standard deviation. Apart from that, LISREL Program was utilized to analyses structural equation model. On the other hand, the ney informants used for qualitative research was comprised of 12 experts and fishermen, obtained by purposive selection. The tools used for data collection were in-depth interview and focus group. The collected data was analyzed by means of content analysis. The results of the study were as follows: 1) There were 5 main factors of coastal fisheries resources sustainable development in Koh Sichang District, Chonburi

Province, namely: economy, environment, society, ecology system, and institution. Apart from that, there were 10 minor factors and 50 indicators of the development. Every factor significantly relates with every indicator, as a whole, at a high level. 2) The sustainable coastal fishery resource development model Koh Si Chang district Chonburi province emphasize community participation government and private agencies and related persons Strengthen awareness of coastal fishery resource development among other students and young people. To bring sustainable benefits to the community.

This study similarly showed that applied the concept of sustainable of cassava production system which are consisting of Social, Economic and Environmental aspect variables these in investigated and however, the four predictor variables comprising of Institutional (In), Management (Ma), Participation/ cooperative (Pa) and Physical (ph) were mainly factors respectively. These more indicated that institutional (in) factors which expended on extension promoting and supporting with knowledge accessing to management of cassava plantation could be expending to correlation to sustainability with management practice However, many scientists has been attempt to investigated the sustainable to cassava production.

Conclusion

1. Factor influencing to sustainability of cassava production system in Bolikhamxay province, general form of multiple regression models within unstandardized value and the combinations of explanatory variables show the important independent variables which is included given. Institutional (In), Management (Ma), Participation/cooperative (Pa) and Physical (ph) were mainly factors respectively

2. Determination of model of sustainable development cassava production system in Bolikhamxay province, Lao PDR, there are summarized into 4 models with total of 17 activities. 1) social and cultural development for cassava production group, 2) Economic development for cassava production group, 3) Natural resources and environmental development for cassava production group and 4) Group strength development for cassava production group. The most appropriate model is a social and cultural development for cassava production group which is indicated that the validity and feasibility were passed the criteria with led high value.

Contribution

Upon completion of this research, the following output value and benefits will be appeared below

1. Brief context knowledge on cassava production system in Lao PDR.

2. The most important identify factors influencing to sustainability of cassava production system in Bolikhamxay province, Lao PDR.

3. The appropriate the model for sustainable cassava production systems in Bolikhamxay province, Lao PDR.

4. The implementation results of the model for sustainable cassava production systems in Bolikhamxay province, Lao PDR.

5. The model will enable supported basic information and Potential value contributes to the policy maker and decision-making processes of marketing options and extension for improved production techniques to the cassava growers.

6. Significant application of the research findings for other future academic purposes.

Suggestion

There are summarized in 4 main categories models under total of 17 activities with most of each category models were pass the specify criteria with higher value. Thus, all most the model of sustainable development for cassava production system in Bolikhamxay province, Lao PDR could be able to apply in the real local due to which is validity and feasibility with mean of higher than 3.51 of all aspects. However, these factors can be used only this specific area and the basic information could be able to recommend for extension worker who devising strategies of government policy in further development of sustainable cassava production in Lao and spread to the other relevant sectors such as:

1. Agricultural organization sectors would be have supporting to social and cultural development to cassava production group

2. Administration of each level and industry and commerce sectors would be have supporting to economic development for cassava production group

3. Environment and agricultural organization sectors which are controlling guidelines for natural resources and environment development for cassava production group

4. Farmer group, village leader, administration of each level, industry and commerce sectors and other organization integrated to participatory on development group strength of cassava production group

Limitations

It does come with some limitations.

1. Should be more considered on dry season of cassava cultivation systems in different technologies or improved management practices are needed to improve for the individual households for cassava production practice

2. Determine the influencing factor to sustainable of cassava production system could be applied with more other categories by the concept theory

3. Modelling determination of sustainability for cassava production system in Bolikhamxay province, Lao PDR would be applying to other cash crop with results comparison

4. The activities of the model sustainability for cassava production system in Bolikhamxay province, Lao PDR, could be more study in apply phase such as project implementation and evaluation of economic development, social with culture development and group strength development for cassava production in Bolikhamxay province, Lao PDR

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