

INTELLIGENT CROPPING SYSTEMS FOR ADAPTATION TO CLIMATE CHANGE

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SUMMARY

The study was implemented to assess cropping model, adapting to climate change in Ky Phu commune - Dai Tu district - Thai Nguyen province. The data was collected and analyzed in the field and household. Based on the results of the evaluation about economic, social and environment indicators, we can draw the conclusion that the winter potatoes, peanuts and intercropping red sugarcane and peanut gives the best performance, that is the system of smart crops adapting to climate change in Ky Phu commune, Dai Tu district, Thai Nguyen province. These cropping systems bring the highly economic and social efficiency whether climate change have caused a lot of extreme weather events, causing the greatly negative impacts on the lives of most people especially to the agricultural production.

Key words: *climate change, cropping systems, climate-smart agriculture (CSA), adapt to, Ky Phu*

INTRODUCTION

Today, the threats and challenges of the environment is no longer limited to the extent of each country or region that was globally. Some of the greatest challenges facing by the humanity such as natural disasters and climate change, rainfall is unusual the main manifestations of climate change (CC) [1]. Climate change has a direct impact on economic society life and the global environment. Climate change (CC) caused a major disturbance to the world, especially in Vietnam with more than 70% of the population live mainly based on agriculture [2]. Along with climate change, there is the issue of food security that due to limit agricultural area, at risk of degradation under the action of nature and the lack of human consciousness in the process of production [4].

Smart cropping systems were deployed and achieved tremendous success in many countries around the world such as USA, Canada, Japan, etc [3]. In Vietnam, the Ministry of Agriculture and Rural Development has a lot of projects and solutions in agriculture on crops in recent times.

Ky Phu is one of 19 communes in Dai Tu district, the living condition is more difficult, people live mainly from agriculture production. Thus, the impact of climate change is enormous for people.

In order to assess the cropping systems for finding the best plants which can adapt to climate change in Ky Phu commune - Dai Tu district Thai Nguyen province, we conducted the research:

"Intelligent cropping systems for adaptation to climate change".

MATERIALS AND METHODS

Object research

Object in this study is assessing cropping models adapting to climate change in Ky Phu commune -Dai Tu district Thai Nguyen province to contribute increased incomes and improved livelihoods for local people.

Methodology

Methods of collecting information: During process of researching, some key tools used to collect information such as Interview in locality, Group discussion, Collecting and combining with the secondary data through previous documents from local commune, district and province.

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Statistical methods and effective evaluations:

To assess efficiency of plants, we analyzed and processed data that was collected. Data collection was processed by Excel.

Information Processing Methods: Both qualitative and quantitative methods analysis were used in this study. The survey data were coded, entered and statistically processed by Excel 2003 software.

RESULT AND DISCUSSION**The natural conditions and socioeconomic in research area**

Natural condition and climate: Ky Phu Commune is a mountainous commune that located in the south of Dai Tu district, Thai Nguyen province, far from district center about 10 km. Ky Phu commune has a total natural area is 1835.47ha, divided into 10 villages. There are two seasons in Ky Phu commune: rainy season from April to October, the climate is hot, humid and rainy; while dry season from November to March, the Northeast monsoon prevails, with little rainfall, dry weather. Features are hot, humid tropical climate; the average temperature is about 22.9°C every year. In the rainy season, rainfall intensity is high accounting for nearly 80% of total rainfall in a year.

Economic social characteristics: The population on March 4th, 2010 was: 7240 people, 1921 households. The density of

agriculture reached 76.7%; industry handicraft was 14.3%; Commercial Services was 9%.

Table 1. Basic information of Ky Phu commune

No	Criteria	Unit	Ky Phu
1	Households	Number	2,122
2	Population	Person	7,410
3	Ethnic	Group	8
4	Poverty rate	Percentage	7.31
5	Income/person/year	Million	19.2

(Source: Ky Phu commune's Socio-economic report, 2014)

Constructing the system of smart-farming adapting to climate change in Ky Phu commune**Assessing the economic efficiency**

After collecting and analyzing from survey form in Ky Phu commune, we had the result as follows:

The survey results showed that: The level of labor investment and workday value of farmers, growing different crops were different.

The different crops required different level of labor investment, the largest of which was the annual crops with 1662 labors and the lowest was the rice with 277 labors. Some types of plants that required more working days and given the higher workday values such as red sugarcane, spring rice – winter rice – potato, spring rice – winter rice – haricot.

Table 2. Economic efficiency of different crops (Calculated in one ha)

Types of agricultural production	Types of crops	Farmer (person)	Income (1000vnd)	Workday value (1000vnd)	Capital efficiency
Two rice – one crop	Spring rice – winter rice – potato	609	71827.65	117.87	2.8
	Spring rice – winter rice – haricot	532	74386.97	116.76	5.2
	Spring rice – winter rice – winter corn	366	28043.33	67.49	1.38
Only rice	Spring rice – winter rice	277	1984.75	71.42	1.67
Only crops	Summer peanut – winter peanut	444	57442.9	129.61	4.39
Annual plants	Red sugarcane – summer peanut	1662	348544.6	209	7.9

(Source: Collecting and classifying from survey)

Assessing the social efficiency of different crops:

The social efficiency of different types of farming production Ky Phu presented in table 3:

The study results showed:

Among six types of farming production, the group of spring rice – winter rice – winter corn gives low social efficiency, the other two groups reach the social efficiency at medium level, those are spring rice – winter rice; and summer peanut – winter peanut.

Among six types of farming production, there are 3 types of crops bringing high social efficiency, which are spring rice – winter rice – potato; spring rice – winter rice – haricot; and red sugarcane – summer peanut.

In general, all type of cropping systems in the commune has been planted for a long time ago, and sold on the spot market, and partly

consumed in the surrounding areas such as Pho Yen, the town of Dai Tu, Thai Nguyen city, which contributed to job creation, attracted labor and rose incomes, increased life quality for the people.

Assessing the environmental efficiency

We build a table evaluating environmental efficiency presented on 3 levels: High - H; Medium - M; Low - L based on three criteria effecting the environment of the current land use patterns such as: The suitability of cropping system for land, the degree of using fertilizers, particularly inorganic fertilizer follow by table 4.

According to analysis and the assessment of environmental efficiency of cropping models, the evaluation of environmental efficiency of different types of plants on the commune area is shown in table 5.

Table 3. Assessing the social efficiency of different farming productions

Types of agricultural production	Types of crops	Farmer (person)	Workday value (1000vnd)	Capital efficiency (times)	Conclusion
Two rice – one crop	Spring rice – winter rice – potato	H	H	M	H
	Spring rice – winter rice – haricot	H	H	H	H
	Spring rice – winter rice – winter corn	L	L	L	L
Two rice	Spring rice – winter rice	L	M	L	M
Only crops	Summer peanut – winter peanut	M	M	H	M
Annual plants	Red sugarcane – summer peanut	H	H	H	H

Abbreviation: H-High, M-Medium, L-Low

(Source: Collecting and classifying from survey)

Table 4. The gradation of evaluating the environmental efficiency of cropping systems

Degree of using fertilizer	Degree of using pesticide	Suitability of cropping system for land
Improving soil fertility	Low on use	Rotational crops, 3 harvest seasons
Maintaining soil fertility	Safe dose	Specializing crops, 2 harvest seasons
Degrading soil fertility	Exceed the prescribed dose	Monoculture, 1 harvest season

(Source: Collecting and classifying from survey)

Table 5. The environmental efficiency of different cropping systems in Ky Phu Commune

No.	Crops	Diversity of crops	Pesticide	Fertilizer	General assessment
1	Spring rice – winter rice – potato	H	M	M	M
2	Spring rice – winter rice – haricot	H	M	M	M
3	Spring rice – winter rice – winter corn	H	L	M	M
4	Spring rice – winter rice	M	M	M	M
5	Summer peanut – spring peanut	M	H	H	H
6	Red sugarcane – summer peanut	L	H	H	H

(Source: Collecting and classifying from survey)

CONCLUSION

Ky Phu is a mountainous commune, Dai Tu district, Thai Nguyen province the proportion of people working in the agricultural sector reached 76.7%. Therefore, the impact of climate change to the lives and production of residents are very concerned problems and need the attention of the authorities and the local people. Improving the local people capacity helps to cope with climate change, a number of production models adapted to climate change that such as model Cold adapt crops (potatoes); peanuts, intercropping red sugarcane and peanut. These models offer high performance and better adapt to climate change situation today.

TÓM TẮT HỆ THỐNG CÂY TRỒNG THÔNG MINH THÍCH ỨNG VỚI BIẾN ĐỔI KHÍ HẬU

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Nghiên cứu hệ thống cây trồng thông minh thích ứng với biến đổi khí hậu được thực hiện tại xã Kỳ Phú - huyện Đại Từ - tỉnh Thái Nguyên. Dựa trên kết quả đánh giá các chỉ tiêu kinh tế, xã hội, môi trường cho thấy: cây khoai tây vụ đông, cây lạc và mô hình xen canh mía tím và lạc sẽ cho hiệu quả cao nhất, đó chính là các hệ thống cây trồng thông minh thích ứng với biến đổi khí hậu tại xã Kỳ Phú - huyện Đại Từ - tỉnh Thái Nguyên. Các hệ thống cây trồng này vẫn cho hiệu quả kinh tế - xã hội cao dù cho biến đổi khí hậu trong những năm gần đây gây ra rất nhiều hiện tượng thời tiết cực đoan gây ảnh hưởng lớn đến đời sống của người dân nhất là quá trình sản xuất nông nghiệp.

Từ khóa: biến đổi khí hậu, hệ thống cây trồng, nông nghiệp thông minh với khí hậu, thích ứng, Kỳ Phú

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