Farmer Decision Making on Crop Selection for the Fallow Period after Sugarcane ratoon, Ban Haed Khon Kaen, Thailand

การตัดสินใจเลือกปลูกพืชหลังการเก็บเกี่ยวอ้อยตอ กรณีศึกษา อำเภอบ้านแฮด จังหวัดขอนแก่น ประเทศไทย

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ABSTRACT

The research explored "Farmers' Decision Making on Crop Selection for the Fallow Period after Sugarcane ratoon" in Nong-saeng sub-district, Ban-had district in Khon Kaen. The overall objectives of the research were: (a) To determine the main cropping patterns practiced in the area; (b) To identify the main factors affecting farmers' decision making in crop selection after sugarcane ratoon. Recently, with the introduction of improved upland rice, land use has been intensified. The study focused on two alternative crop choices after sugarcane ratoon: cultivation of rainy season cassava and improved upland rice. Using purposive sampling method, 30 respondents, which included 14 rainy season cassava and 16 upland rice growers, were selected. The results showed that there are basically two cropping models: Sugarcane + upland rice and sugarcane + rainy season cassava over two year period. And the main factors influencing farmers' decision making on crop choice is dominated by physical conditions more than relative profitability of crop. And the majority of farmers prefer to grow upland rice. Cassava on the other hand, is not favored due to soil moisture and disease problems in sugarcane field plots.

บทคัดย่อ

งานวิจัยชิ้นนี้เป็นการสำรวจการตัดสินใจปลูกพืชของเกษตรกรช่วงหลังเก็บเกี่ยวอ้อยตอ ของเกษตรกรในพื้นที่ตำบลหนองแซง อำเภอบ้านแฮด จังหวัดขอนแก่น โดยมีวัตถุประสงค์ (a) เพื่อศึกษารูปแบบการเลือกปลูกพืชของเกษตรกรในพื้นที่ (b) เพื่อจำแนกปัจจัยที่มีผลต่อการตัดสินใจของเกษตรกรในการตัดสินใจปลูกพืชหลังเก็บเกี่ยวอ้อยตอ การเริ่มปลูกข้าวไร่ โดยเฉพาะพันธุ์ที่ได้รับการปรับปรุงในช่วงไม่กี่ปีที่ผ่านมา ทำให้การใช้ประโยชน์ที่ดินมีความเข้มข้นมากขึ้น งานวิจัยได้มุ่งความสนใจไปที่พืชทางเลือกสองชนิดหลังอ้อยตอ คือ มันสำปะหลังฤดูฝน และข้าวไร่ที่ปรับปรุงพันธุ์ โดยสุ่มเกษตรกร 30 คนโดยวิธีการสุ่มแบบจำเพาะเจาะจง(purposive sampling) ซึ่งได้เกษตรกรที่ปลูกมันสำปะหลังฤดูฝน 14 ราย และเกษตรกรที่ปลูกข้าวไร่ 16 ราย ผลการศึกษาพบว่า รูปแบบการเลือกปลูกพืชหลังเก็บเกี่ยวอ้อยตอที่เกษตรกรเลือกเป็นหลัก 2 แบบ คือ อ้อยตอ+ข้าวไร่+อ้อยปลูกใหม่ และอ้อยตอ+มันสำปะหลังหน้าฝน+ข้าวไร่+อ้อยปลูกใหม่ ซึ่งปัจจัยหลักที่มีผลต่อการตัดสินใจเลือกปลูกพืชหลังอ้อยตอ คือ สภาพทางกายภาพของพื้นที่ มากกว่ากำไรที่คาดว่าจะได้รับจากการปลูกพืชดังกล่าว และเกษตรกรชอบที่จะปลูกข้าวไร่หลังอ้อยตอ มากกว่า ปลูกมันสำปะหลังหน้าฝนหลังอ้อยตอ ทั้งนี้เพราะมันสำปะหลังมีความเสี่ยงเรื่องความชื้นในดินและโรคที่มาจากแปลงอ้อยตอ

Key Words: Farmer decision making; Sugarcane based farming system; khorat plateau

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Introduction

"…To know what farmers practices are not a major problem. However, to understand it clearly, in some cases, is far more difficult.".

Farmers must yearly allocate fields to different crops and choose crop management options. Far from being obvious, these decisions are critical because they modify farm productivity and profitability in the short and long run. Decisions have strong impacts on resource use efficiency and on environmental processes at both farm and landscape scales. Cropping plan and crop rotation decisions are on the contrary dynamic processes incorporated into succession of other planned and adaptive decisions made at annual and long-term horizons. At the same time, decisions regarding cropping plans involve the meeting of multiple and competing objectives (Stone et al. 1992; Piech and Rehman 1993; Foltz et al. 1995; Bartolini et al. 2007; cited by . Ultimately, objectives that influence the selection of a cropping plan have to reflect goals, perspectives and values of the decision-makers.

In spite of the difficulty of a hostile environment, Northeast farmers have adapted and built communities which were assured of survival due to the agricultural skills they brought with them as well as the social organizations they built and the cultural customs they practiced. The sensible agricultural practices…the functional utility of family organization and inheritance are all extremely meaningful in the context of the Northeast (Ng, 1978). Gustafson did not fail to acknowledge such ingenuity of the Northeasterner farmer when he wrote [For the better part of the 20th century] A harmonious relationship between man and land has always been maintained, even with the environmental difficulties and unpredictability" (Ng, 1978) cited by .

Upland areas in Asia allow farmers to switch between rice and non-rice crops due to their physical conditions. From this perspective, the upland areas in Southeast Asia are said to be flexible in crop diversification compared to the mono-crop rice lowlands .

The Khorat Plateau in Northeast Thailand is slightly different from other upland areas in SEA. However, as Fukui indicates, the Khorat Plateau in NET is different and exceptional in terms of the characteristic topography of the Asian rice zone because of the scarcity of water for irrigation chiefly due to the

forbidding topography of the area leaves agriculture at mercy of quantity and pattern of rainfall for rice growing . Out of which, 70 percent is upland leaving only 30 percent lowlands suitable for rice production.

Because of the fact that production decisions are almost always made under uncertainty (weather, market) and that there may be several sowing seasons per year, cropping plan decision-making does not merely involve a single decision but is a continuous process occurring all throughout the year(Aubry et al. 1998b; Nuthall, 2010; cited by . It may be said that farmers in the Khorat Basin have been adapting their land use in response to various external factors, namely, government policies, macro-economic shifts, and market responsiveness. But most importantly, as Rambo points out, selection of crops is the primary means by which Isan farmers adapt to poor soil conditions. This leads to the notion that NE farmers are practical and are able to manage land rationally under harsh conditions.

The total land area of Nong-saeng is about 29,678 rai. Out of which, 70 percent is upland leaving only 30 percent lowlands suitable for rice production. There are 234 households in Non-saeng. The average land holding size is about 20rai/hh.

Objectives of the study

1. To investigate changes in cropping choices in post sugarcane ratoon period.
2. To analyze the important factors influencing farmers' cropping choices after the sugarcane ratoon.

Methodology

Site selection – The study site is in Nong-saeng village in Ban-had district, Khon Kaen province. It's about 18 kms South of Khon Kaen. The area is predominantly upland and with an average elevation of 180m asl. Nong-saeng village was selected as the study area because recently with the introduction of improved upland rice and sugarcane, there have been many changes concerning cropping patterns.

The study was conducted between June to Dec., 2013.

Research Design - After reviewing extensively on upland cropping systems regarding Southeast Asia and gaining sufficient understanding and secondary data collection, the author went to the field and carried out field reconnaissance survey by visiting some

sugarcane, cassava and upland rice growing farms in three villages in the upland areas Ban-had. Following that, subtopics were prepared and discussions were made with 3 experienced farmers and 5 KIs. Based on that, a Conceptual Framework, research questions and objectives were developed.

Sample Selection - The research is qualitative in nature and 30 sugarcane based farmers were selected using purposive selection methods. First 14 farmers who planted cassava and 16 farmers who planted upland rice whose land were located adjacent to the cassava growers were selected.

Data collection - were collected using both semi-structured questionnaire and in-depth interview. The data collected were then analyzed using factor analysis and case comparison. Finally, the results were validated using farmer group discussion.

Data analysis – data collected were analyzed on case comparison and typology based land use and cropping patterns of farmers.

Results

According to results obtained, basically there are that farmers can select a model of cropping with or without sugarcane rotation with upland rice can choose between two cropping patterns (as follows):

Model I:

Sugarcane + Sugarcane ratoon and (followed by fallow period)

Model II:

Sugarcane + Sugarcane ratoon followed by upland rice or cassava

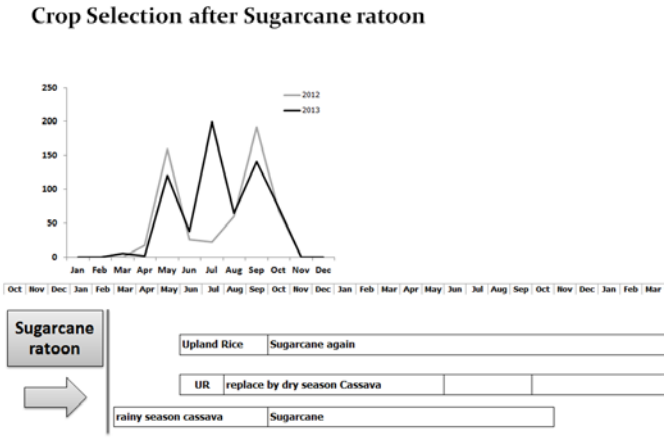

Fig. 1 Farmer crop selection decision making after sugarcane raoon.

Some of the reasons why these cropping patterns are practiced by farmers are presented below:

Model I*: Sugarcane + sugarcane ratoon*

Sugarcane cultivation, including ratoon is the most common cropping pattern and it is practiced by the majority of farmers. According to data analyzed, 65% of the total area of the sample farmer's land were

planted to sugarcane. Farmers clearly indicated their preference for sugar for the following reasons:

1. *Sugarcane is a 'safe and easy' to manage*

Since the sugarcane industry is very well established, entering into the production of sugarcane offers many advantages. Farmers can get credit, technical support, inputs…etc. from the sugar mill company. Besides, prices are pre-determined so, they know what they would get already by the sugarcane board every years; therefore, farmers know already.

2. *Labor demand can be reduced by machinery hiring*

Generally, sugarcane does not need frequent labor attendance except in planting and harvesting. Nowadays, both of these activities can be handled with machinery use. At the same time, minimum attendance allows farmers to seek off farm work.

3. *Farmers can get more than one harvest from one time planting*

By planting only one time, farmers can get more than one harvest from sugarcane. This reduces the production cost, such as frequent plowing and plowing, buying sugarcane stalks…etc. Generally, farmers harvest two times or even three times if soil can store adequate moisture or if in the lowland areas.

4. *Sugarcane has flexible marketing system*

Farmers can sell their sugarcane "as green" at any stage of crop development up until harvesting period or they harvest themselves and deliver to factory.

5. *Flexible planting*

Sugarcane can be planted both in lowland and upland. Moreover, sugarcane is moderately tolerant to water submergence. Because due to the sandy nature of soils, the lowland paddies in Nong-saeng are well drained.

Model II: Sugarcane followed by upland rice or cassava

Sugarcane followed by upland rice

There are several reasons why farmers choose to plant upland rice after sugarcane:

1. Rice yield increases by more than 15%;
2. Reduces the need to use chemical fertilization since the following upland rice can make use of the left over fertilizer and residue from sugarcane;

3. Less weed growth problem after sugarcane ratoon (with increased cropping intensity, there is less chance for weeds to grow or to produce seed or mature. Deep plowing can also bury weed seeds)

Sugarcane followed by cassava

It is very rare to find cassava after sugarcane ratoon. This is because cassava is susceptible to high soil moisture. Therefore, rainy season cassava is limited to field plots with good drainage.

On the other hand, cassava after sugarcane can be attacked by worms as well as routing of tubers because accumulated moisture in the fields. Conversely, sugarcane after cassava is not favored by farmers either. As farmers mentioned, sugarcane yield decreases by 10% or more compared to yield obtained after upland rice. This is due to insufficient moisture and reduced fertility of the soil after growing cassava. Besides, there is also the hardpan of soil which increases cost of plowing for next planting.

However, generally speaking, it seems no single cropping is followed consistently or dominantly. The reason seems that there are no overriding factors that make the environment particularly favorable to any specific crop or cropping pattern. But generally, we can say, sugarcane is the most popular crop in Nong-saeng with over 63% of the land under sugarcane.

Financial Returns

A hypothetical comparison was made on the basis of 24 months which the approximate time period it takes for one cycle of sugarcane production. Accordingly, the financial returns were calculated to reflect on farmer's cropping decision making by comparing the financial returns.

Model I: Sugarcane + ratoon Returns per rai = **7,300** Baht per rai

Model II: Sugarcane without ratoon + upland rice Returns per rai = 6130 + 1519 = **7,640** baht/rai

Model III: Sugarcane without ratoon + rainy season cassava

Return per rai = 6130 + 7110 = **9, 640** baht/rai

It shows that the cropping pattern of sugarcane without ratoon followed by rainy season cassava should give the highest financial returns of **9, 640** baht/rai. And the next best option is sugarcane without ratoon followed by upland rice generates **7,640** baht/rai.

However, the first best choice is constrained by disease and soil moisture problem to cassava; loss of soil fertility after cassava and need for male labor for harvesting cassava. And the second best choice is also depends on the rainfall start and distribution for upland rice. Therefore, the majority of farmers follow the first pattern, i.e. sugarcane with ratoon, which they say has no problem even though it generates the least in terms of financial returns.

Generally, beyond growing enough rice for home consumption, farmers allocate rest of their land to sugarcane.

Economic Benefits

Sugarcane

Sugarcane, besides serving as cash crop, crop residue from sugarcane also improves soil quality and is good for the following upland rice production. Besides, sugarcane allows farmers to have time for off farm job.

Upland rice

Main purpose of upland rice is for home consumption but when households have surplus, upland rice is used to generate cash income. Another benefit of upland rice is that it is grown in rotation with sugarcane and breaks the white leaf disease in sugarcane and rice straw also helps improve soil condition which increases soil fertility which helps increase sugarcane production. Farmers can keep their seed and exchange upland rice seed.

Cassava

The importance of cassava as cash generating crop seems to have diminished in Nong-saeng. This is closely related to the introduction and expansion of sugarcane and upland rice. Otherwise, cassava was the main cash crop in the area just few years ago (JIRCAS, 2004). Therefore, even though its price improved from 0.5 b to 2.8 baht/kg recently, but this did not increase cassava cultivation. This is because, as farmers say, prices for cassava often fluctuate; with the introduction of sugarcane and hence machinery plowing, cassava faced problems from accumulated soil moisture and male labor requirement during harvesting.

Therefore, the only advantage farmers mention about cassava is that it can be planted as an emergency crop during crop failure as replacement (especially during dry year)

Factors Influencing Farmer Decision Making in Crop Selection

The most important factors which were found to influence farmer's decision making included, firstly

Physical & biological factors

Rainfall arrival

Because of its variability within and between years, rainfall in the NE Thailand is often described as the critical climatic factor affecting agriculture . As such the effect of rainfall can even be more than or at least as important as physical characteristics of their particular field plots except that farmers know what to do with their land but do not know what to expect about the rains. Rainfall timing subjugates farmers to stand by ready so that they can cultivate their land with the appropriate crop when and if it comes. Such was echoed by farmers in Nongsaeng village. Several farmers mentioned when asked what told the author they would grow in the next season, they would, "If rain comes in early, I will grow upland rice, if not I will wait and see how the rainy season progresses…and then may be…if I get cassava stalks, I may plant cassava. Otherwise, I leave it fallow and plant sugarcane by the end of the season." And it is not that there aren't other "ifs" but that is the position of the farmer, to begin with. This uncertainty with what decision to take is what every farmer experiences.

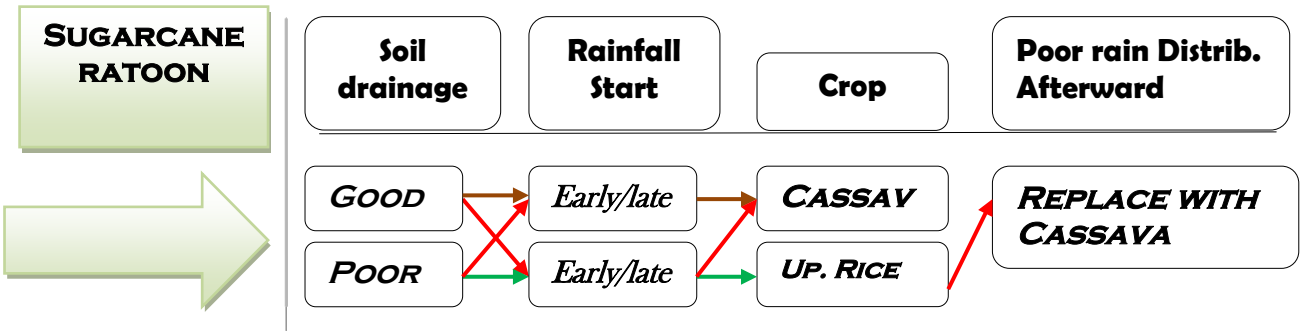

Fig. farmer decision making model

Due to such awareness, farmers in the NE are well known for their strategies to mitigate the effect of rains. Making prudent selection of crops that are different levels water stress and moisture tolerance. Farmers would go as far as choosing varieties yield potential but more stress tolerant.

As shown in the diagram above, farmers depending on the physical conditions of their plots and the start of rainfall plant cassava or upland rice. Or sometimes,

they have to replace upland rice if the distribution of rainfall is not good during the rainy season.

Physical Conditions of Soil/drainage

One of the distinct features of the NE is its undulating topography . The upland parts of Ban-had district is a typical microcosm of such topography. Field plots in the area show a great deal of differences in soil type and fertility, water holding capacity, moisture content, …etc. within few meters spatial differences. Added to the climatic factors, farming and decision making in crop selection requires a great deal of ingenuity on the part of farmers. As strategy, farmers in this area have more than one piece of land scattered in different locations. E.g. among the respondents, they have from 1 to 5 plots while the majority of them have 3-4 plots. The ability of securing such land ownership allows the farmer to maneuver in times of perturbations. Because the more pieces of land a farmer has, the more he or she can diversify. This said, however, even farmers with one plot of land try to diversify. Planting several crops is a risk minimizing strategy.

As such land physical conditions could be by far the most important factor in farmer decision making with regards to crop. No farmer came short of mentioning land physical condition as the reason behind their selection for a particular crop.

For e.g. a plot that is poor in drainage cannot be planted to cassava even if rain comes early in April. On the other hand, if the field plot is well drained then a farmer may plant it with cassava. A land plot that relatively have good moisture is always planted to rice or sugarcane. Land physical condition can be described as a pre-condition for final decision making on crop selection. Indeed land physical conditions over-rules every other factor in decision making.

Crop rotation (biological control)

Crop rotation in sugarcane cultivation is not a new method of production in the NE. As Polthanee mentions that farmers in Amphur Nampong, Khon Kaen Province had practiced peanut and sugarcane cultivation for many years. But nowadays, sugarcane and upland rice are increasingly being cultivated in rotation in the upland areas of Ban-had, farmers practice sugarcane production by rotation with upland rice Hom Sakon. Because of the sandy nature of soil in the environs, white leave disease is prevalent in sugarcane production fields.

Discussion and Conclusions

Even though farmers in Nong-saeng hypothetically have several cropping options from which to choose, in reality however, their cropping options are limited physical conditions of soil and rainfall start and distribution. Due to the unpredictability of rainfall, farmers cannot have a clear pre-determined cropping plan. And farmers are in not in a position to choose the cropping pattern with the highest returns. On the other hand, even though some social and economic factors were found to have some effects, however, their role is reduced as confounding factors because they are overruled by physical and biological factors.

However, farmers have developed a cultural practice that allows them to diversify as well as keep the cropping system through crop rotation. In the short-run, it seems the cropping patterns are stabilized. But in the long-run, the system may be sustainable due over stress of over cultivation, and especially with the great reduction in the number bee cattle and buffalos.

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