

## How to Improve Productivity of Thailand Agriculture and Farmer Activities

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### ABSTRACT

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Land degradation is one of the major constraints of agriculture worldwide including Thailand. Sustainable land management (SLM) practices have been promoted over many decades for helping farmers to increase land fertility, reduce cost, increase crop yield and earn a stable income to meet the standard of living. However, SLM practices are not widely adopted by farmers especially in the Northeast region of the country. The main constraints of doing this practice according to farmers who adopt and adopt-non adopters is the digestion of rice straw which bring about insect destroyed product in the field. Also, if they do it more than one time, it increases production cost. Some of them give up to adopt because of these constraints and turning back to field burning because of it easy to manage. On the other hand, Many farmers learned from the training and believed that this practice would improve soil quality and reduce the cost of fertilizer

Keywords : Farm structure, Farm management practices, SLM practices; Thailand

### I. INTRODUCTION

First, from long time ago it is known that Thailand is an agricultural country. After harvesting, particularly rice straw was burned in the cultivated area and some was left as rice straw and stuff before incorporated into soil. Rice straw compost incorporation plays an importance role on soil nutrients fertility by adding soil nutrient. The composition of fresh rice straw included nitrogen (14.26 kg ha<sup>-1</sup>), phosphorus (1.86 kg ha<sup>-1</sup>), and potassium (35.34 kg ha<sup>-1</sup>) (Saothongnoi

et al, 2014). These components are retained and accumulated in the soil. The nutrients and soil abundance has increased when rice straw was incorporated into soil for several years (Pomnamperuma, 1984).

The results showed that many factors, including education, experience, land tenure security, vegetable producing, water availability, livestock raising, and farming plan, all positively influence SLM adoption. However, there are many limiting factors in adopting

SLM practices. One of the significant factors is the farm organization when farmers hire labor in all farm processes. The findings can contribute to improving better policy toward an increasing adoption rate of SLM. For addressing the issue of reduced-farm labor, there is a need of policy supporting the development

of farm structures in which farmers can get sufficient farm income so that it makes sense for them or for the young generation to adopt farming as the main career. Hence we choose this topic:

“How to improve productivity of Thailand agriculture and farmer activities”.

## II. Previous studies

We look at below table:

Table 1- Previous studies

Authors	Year	Content, results
Saonthongnoi et al	2014	Effect of rice straw management on soil properties in rice soil was conducted in this study. The Pathumthani rice variety was planted in pot experiment by using Kamphaeng Saen soil series (Typic Haplustalfs). The experiment was designed by Completely Randomized Design (CRD) with three treatments of soil preparation which included 1) soil without rice straw or rice straw ash application (control) 2) soil with rice straw incorporation and, 3) soil with rice straw ash incorporation. The rate of rice straw used in treatment 1 and 2 were 13.15 kg m <sup>-2</sup> . Soil properties such as soil pH, %OM, %OC, available P, extractable K, bulk density, Total N, Total C and C/N ratio were determined after growing season and compared with its properties before growing period. Control treatment presented less %OM, %OC and K than soil with rice straw and soil with rice straw ash. Rice cultivation in soil with rice straw incorporation presented highest %OM, %OC compared with other. Phosphorus and potassium contents in rice straw treatment were higher than that control treatment. In addition, lowest bulk density has been observed in soil with rice straw applied. These results implied that rice straw induces soil fertility which is useful for plant growth.

Yao et al	2015	<p>Soil puddlability, a measure of susceptibility of soil to puddling, affects regeneration of soil structure during the rice growth period, but the intrinsic controlling factors are unclear. It was hypothesized that rice straw incorporation and tillage depth influence soil puddlability and soil mechanical and hydraulic properties during the rice growth period as they influence soil organic carbon (SOC) in the plough layer. Using a three-year experiment, the objectives of this study were (1) to determine the effects of rice straw incorporation and tillage depth on root growth traits, sinkage resistance after puddling, and tensile strength, shrinkage capacity, water retention curve and penetration resistance during the rice growth period, and (2) to determine whether mechanical properties from puddling tillage, through the rice growth period, to harvest are correlated with SOC concentration. Rice straw was incorporated partially (C1) and fully (C2) to different depths of plough layer by shallow tillage (ST) and deep tillage (DT). Compared with no rice straw incorporation (C0), rice straw incorporation decreased the sinkage resistance after puddling (<math>C2 &lt; C1 &lt; C0</math>) and increased SOC concentration and aggregate stability. Shallow tillage increased the penetration resistance more than deep tillage irrespective of rice straw incorporation. The difference in tensile strength and total porosity were small among the rice incorporation treatments at the 1st drainage (<math>C2 \geq C1 \geq C0</math>), but became more profound with increasing number of drainage because the tensile strength and total porosity decreased in C0, increased in C2, particularly under ST. The root weight was lower, and the root length was longer in C1 than in C2 particularly at the deeper depth of the plough layer under ST, suggesting the impedance of</p>
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		root growth due to higher sinkage and penetration resistances. SOC concentration was weakly correlated with the sinkage and penetration resistances and the tensile strength after the 1st drainage, but not with the tensile strength after the 2nd and 3rd drainages. In conclusion, rice straw incorporation is important to maintain SOC and then improve soil puddlability and the recovery of pore structure during the rice growth period.
Deng et al	2014	observed that the amount of dispersed aggregates decreased with increasing intensity, but was offset by organic amendments, which was attributed to formation of stable macroaggregates with <u>macropores</u> in the organic amended soil.
Arunrat et al	2023	Rice straw and stubble burning is widely practiced to clear fields for new crops. However, questions remain about the effects of fire on soil bacterial communities and soil properties in paddy fields. Here, five adjacent farmed fields were investigated in central Thailand to assess changes in soil bacterial communities and soil properties after burning

(source: author synthesis)

reasons and constraints of adopting each SLM practices areas

### III. Methodology

Authors mainly use quantitative analysis combined with qualitative analysis (synthesis and inductive methods).

### IV. Main findings

Incorporation tillage of rice straw in soil

Farmers who adopt and willing to adopt each of 11 SLM practices were asked about the reason of adoption (only adoption farmers) and constraints of adoption (adopters and non-adopters who aware and willing to implement). Table below showed the

We see:

Fig 1 - Reasons and Constraints of Adopting Practices

SLM practices	Reason to adopt		Challenge to adopt		Challenge to adopt	
	From adopters		From farmers who want to adopt		From farmers who want to adopt	
1. Soil sampling and analysis	58 adopters		15 people			
	get support from government/ learning center	32	depend on government officer/ difficult to contract	45	I do not know where I can do it	5
	want to know soil status in order to manage in the right way	50	have to collect soil sampling by myself sometimes I confuse how to collect	28	It takes many steps to do it	9
			take time to see the result	21	depending on the services of government	5
		do not get supporting and it is difficult to do	30			
2. Incorporation tillage of rice straw in soil	63 adopters		22 people			
	believe in the good result that learns from training	52	no	13	My family does not agree to do	4
	less time spend/ easy to do/ use machine	49	take time	24	Afraid to lose productivity but want to try	10
	better than burning because not kill good soil bacteria	31	insect	48	Cost of tillage machine	8
	want to improve soil quality	37	crab	1	Drought problem	14
			weed	6		
			neighbor farm burning	16		
		digestion of straws	43			

(source: Phastraporn Salaisook , Thesis 2019)

What reasons for farmer to adopt or not adopt the Incorporation tillage of rice ?

We will analyze in the below table:

Costs	Benefits
<p>-Out of 150 farm study, there are 15 farms adopt all 11 practices while 47 farms do not adopt any practices. The data showed the different level of adoption and constraints to adopt of farmers</p> <p>- this practice requires specific knowledge and have to buy some raw materials, require more time/labors for implementing, and take time to see the good results.</p> <p><b>-using traps for insects so increase costs and hard to do</b></p> <p><b>- tillage the soil</b></p> <p>- The main constraints of doing this practice according to farmers who adopt and adopt-non adopters is the digestion of rice straw which bring about insect destroyed product in the field.</p>	<p>- The adding animal dung for improving soil fertility (63%) is the practice that most farmers are adopting, while bio-pesticide (18%) are the less adopting</p> <p>- Many farmers learned from the training and believed that this practice would improve soil quality and reduce the cost of fertilizer</p>

**V. RESULTS AND DISCUSSION**

Rice straw incorporated into soil was then slowly decomposed and induced reduction rate of nitrogen immobilization result in low nitrogen content in soil. Directly affect occurred to rice plant which was

presented as yellow leaves, dark roots, low nutrient uptake efficiency and low rice grain yield (Broadbent, 1979).

According to farmers, this practice is easy to do because nowadays most of them use the machine for plowing the land. In the study areas farmers tillage the soil before growing plant, some of them use the small machine if the land is small, and some of them use a big machine. For the reason why farmers adopt this practice, it is because they heard that these practices would enhance soil fertility and better than burn the field. Many farmers learned from the training and believed that this practice would improve soil quality and reduce the cost of fertilizer. The constraints observed in the field is some farmers do it one time per year; some farmers do it two time or three times per year. It feels like they are confusing about how many time they have to do it as an efficient recommended by experts and it seems like many of them do not know the right way to do.

If farmers implement it only one time and see the efficiency of soil quality improvement, they will adopt.

Since adopting does not increase the cost of land plowing (usually farmers have to plow the soil 2 times before growing rice event though they are putting a fire or not, if this practice not require more plowing than 2 times and not required any labors, and bring farmer the good result, farmers will adopt). The main constraints of doing this practice according to farmers who adopt and adopt-non adopters is the digestion of rice straw which bring about insect destroyed product in the field. Also, if they do it more than one time, it increases production cost. Some of them give up to adopt because of these constraints and turning back to field burning because of it easy to manage.

About 90 of interviewees use tillage machine for plowing the soil in order to save time and labors. This

practice has been introduced for solving paddy field burning after harvesting rice season. Only 4% of interviewees do not know about these practices, and 42 of them already adopt these practices. Farmers who adopt this practice believed in the cost-benefit of it in term of soil quality improvement. They know to maximize the benefit of this practice. However, for farmers who adopt and give up, the main constraints observing is the knowledge of farmers to make this practice efficient. Farmers plow the straw without using bio-liquid fertilizer for help to decompose the straw in the soil. They are confusing about the number of time needed to do tillage for the effective result of the practice. Many of them give up to adopt onetime implementation because the rice straw does not decompose which brings about insect destroyed the crop and low yield. Usually, farmers have to do tillage only 2 times, while adoption this practice, some of them tillage 3 times which is cost increasing. Farmers who fail to adopt this practice, they do not spray liquid fertilizer before tillage. They do tillage only 2 times as usual. Some adoption farmers stressed that neighbors' farm burning is one of the constraints of doing this practice. For farmers who see the good result from adoption farmers, they willing to adopt but the main constraints according to them are the cost of the tilling machine, family agreement because they are afraid to lost profit.

## VI. Conclusion

Moreover, most of them do not know about the soil free test services by LDD since they have to contact by internet. These can be significant constraints of this innovation. The result of the soil test of farmers who register on the LDD website will be sent to ALC or head of village for distributing to farmers. By the way, many of them have not known the result of soil test of their land yet while many farmers have no ideas to do soil test without supporting of government. Farmers aware and want to implement these practices, but they do not have sufficient information and face

some constraints such as they have to collect the soil sampling which requires the specific knowledge to do it. Even though, they aware and willing to implement the practices, they are struggling with the way of soil sample collecting and sometimes for the old farmers they lack of power and incentive because of the practice depending on government services.

Many farmers do not know where they can do soil test while those who aware but not willing to adopt because it takes many steps and takes time to see the results. They do not want to spend time collecting soil and waiting for the result of a soil test. They said that they know the condition of the soil and the soil constraints have occurred on their farm for many decades. These farmers do not believe that soil test can solve the soil problems in their farm and they are not interested and do not see the cost and benefit of adoption.

Thus, the main factors influencing in this practice is the numbers of training and meeting. The more farmers participated in the meeting, the more they adopt these practices. For farmers who aware and want to implement, their main constraints are the information sharing about where they can get the service with the complicated step of contracting LDD staffs.

According to farmers, adding animal dung is local knowledge which material can find at local. Farmers know the benefit of these practices for many decades. However, for bio-pesticide, this practice requires specific knowledge and have to buy some raw materials, require more time/labors for implementing, and take time to see the good results. That is a reason why the only vegetable producing's farmers adopt this practice for getting a certificate and selling as a geed price.

Some practices are appropriate for the small size of land if it requires a big quantity per rai whereas some

practices appropriate for all farm size. Farmers' adoption level of each practice depends on raw material, labors available, knowledge, and budget to buy the input.

Our finding is in line with the study of Stuart et al. (2018), the major's key challenges faced by rice farmers are labor shortage, increased input cost, reduced availability of water, and a degrading environment. In Southern of Thailand, determinants of adoption of crop diversification by smallholder rubber producers were depended on the quantity of water, attendance at agricultural training, price fluctuations, savings, and schooling period.

(Longpichai, 2013). Moreover, Kersting and Wollni (2012) found that farmers are more likely to adopt if they are better educated and more experienced, and if they have access to female family labor, improved farming technology, and information and extension services support by organization and institution are vital to enable small-scale farmers to adopt the standard.



Fig 2 - Thailand agriculture

(source: Phastraporn Salaisook , Thesis 2019)

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### VII. REFERENCES

- [1]. Anusontpornperm, S., Thanachit, S., Suddhiprakarn, A., & Kheoruenromne1, ., (2015). Degraded sandstone and siltstone-derived soils in Northeast Thailand: the attempts to improve their quality. Global Soil Security 2015, TX A&M: International Conference on 'Collective
- [2]. Progress of Soil Science in the International Year of Soil, and Planning of the Nexus
- [3]. Decade' December 3-5, 2015. Department of Soil Science, Faculty of Agriculture
- [4]. Kasetsart University, Bangkok, Thailand, Retrieved July 21, 2018, from <https://dl.sciencesocieties.org/files/publications/meetings/ssa/gss/somchai.pdf>
- [5]. Asian Institute of Technology. (2013). Report of an expert consultation workshop on Sustainable Land Management (SLM) regional action programme formulation to respond to climate

- change in Synergy with the Three Rio Conventions. Thailand
- [6]. Asia-Pacific Economic Cooperation. (2011). Scientific workshop on Sustainable Land Management (SLM) to enhance food production of APEC members ... (n.d.). Retrieved July 23, 2018, from <https://aimp2.apec.org/sites/PDB/Lists/Proposals/DispForm.aspx?ID=352>
- [7]. Asrat, P., & Simane, B. (2017). Household-and plot-level impacts of sustainable land management practices in the face of climate variability and change: empirical evidence from Dabus Sub-basin, Blue Nile River, Ethiopia. *Agriculture & food security*, 6(1), 61.
- [8]. BT Suu, DTN Huy, NT Hoa. (2021). Sustainable value chain issues, insect traps and solutions for coffee berry borer in the north of Vietnam, *Plant Cell Biotechnology and Molecular Biology* 22 (55&56), 74-83
- [9]. BT Suu, VQ Giang, VP Lien, DTN Huy, HT Lan. (2021). The auto-infection trap with the native entomopathogenic fungus, *Beauveria Bassiana* for management of coffee berry borer (*Stephanoderes Hampei Ferrari*) in the northwest region, *Alinteri Journal of Agriculture Science* 36 (1), 191-198
- [10]. Bangkok Post. (2018). Survey finds 40% of farmers live under poverty line. Retrieved August 3, 2018, from <https://www.bangkokpost.com/news/general/1475901/survey-finds-40-of-farmers-live-under-poverty>
- [11]. Dat, P. M., Mau, N. D., Loan, B. T. T., & Huy, D.T. N. (2020). Comparative China Corporate Governance Standards after Financial Crisis, Corporate Scandals and Manipulation. *Journal of security & sustainability issues*, 9(3).
- [12]. Deng et al. (2014). Effects of simulated puddling intensity and pre-drying on shrinkage capacity of a paddy soil under long-term organic and inorganic fertilization *Soil Till. Res.*, 140 (2014), pp. 135-143
- [13]. DT Ngoc-Huy, NT Hang, P Van Hong. (2021). Food and drink processing from lychee products in the northern provinces of Vietnam-and roles of agriculture project financing, *Revista de Investigaciones Universidad del Quindío* 33 (1), 187-195
- [14]. DT Tinh, NT Thuy, DT Ngoc Huy. (2021). Doing Business Research and Teaching Methodology for Undergraduate, Postgraduate and Doctoral Students-Case in Various Markets Including Vietnam, *Elementary education Online* 20 (1)
- [15]. Hanh, P. T. M., Hang, N. T., & Huy, D. T. N. (2021). Enhancing Roles of Banks and the Comparison of Market Risk and Risk Policy Implications in Group of Listed Vietnam Banks During 2 Stages: Pre and Post-Low Inflation Period. *Revista geintec-gestao Inovacao e Tecnologias*, 11(2), 1723-1735.
- [16]. ThiHoa, N., Hang, N. T., Giang, N. T., & Huy, D. T.N. (2021). Human resource for schools of politics and for international relation during globalization and EVFTA. *Elementary education online*, 20(4), 2448-2452.
- [17]. Hoa, N. T., Huy, D. T. N., & Van Trung, T. (2021). Implementation of Students's Scientific Research Policy at Universal Education Institutions in Vietnam in Today Situation and Solutions. *Review*
- [18]. Le, T. H., Huy, D. T. N., Le Thi Thanh Huong, N. T., & Hang, S. G. (2021). Recognition of user activity with a combined image and accelerometer wearable sensor. *Design Engineering*, 6407-6421.
- [19]. Limtong, P. (2012). Status and priorities of soil management in Thailand. Presented in Workshop on Managing Living Soil, 5-8 December 2012. FAO, Rome, Italy.
- [20]. Longpichai, O. (2013). Determinants of adoption of crop diversification by smallholder



- rubber producers in Southern Thailand: Implications on natural resource conservation. *Kasetsart Journal of Social Science*, 382, 370-382.
- [23]. Lorsirirat, K., & Maita, H. (2006). Soil erosion problems in northeast Thailand: A case study from the view of agricultural development in a rural community near Khon Kaen. *Disaster mitigation of debris flows, slope failures and landslides*, 675-686.
- [24]. Land Development Department. (2018). Main projects of land development department (n.d.).
- [25]. Retrieved July.22.2018, from [http://www.ddd.go.th/EFiles\\_html/main%20project/Mainproj.htm#13.%20Soil%20and%20Water%20Conservation](http://www.ddd.go.th/EFiles_html/main%20project/Mainproj.htm#13.%20Soil%20and%20Water%20Conservation)
- [26]. LT Hue, NT Thuy, DTN Huy, NV Binh, DTT Huyen, NTM Thao. (2020). Factors affecting the access to bank credit of smes in northeastern region, vietnam, *International Journal of Entrepreneurship* 24, 1-12
- [27]. Nam, V. Q., Tinh, D. T., Huy, D. T. N., Le, T. H., & Huong, L. T. T. (2021). Internet of Things (IoT), Artificial Intelligence (AI) Applications for Various Sectors in Emerging Markets-and Risk Management Information System (RMIS) Issues. *Design Engineering*, 609-618.
- [28]. NT Hang et al. (2021). Educating and training labor force under Covid 19: Impacts to meet market demand in Vietnam during globalization and integration era, *JETT* 12 (1), 179-184
- [29]. NT Diep, TD Trang, LT Hue, DTN Huy. (2022). Analysis of Marketing Strategy of Food and Milk Products for Children in Vietnam Market- And Legal Matters of Protecting Rights of Consumers Who Are Children in the Economy, *International Journal of Early Childhood Special education* 14 (3)
- [30]. PT Anh, NTN Lan, NTM Hanh, DTN Huy, BTT Loan. (2020). SUSTAINABLE CONSUMPTION BEHAVIORS OF YOUNG PEOPLE IN THE FIELD OF FOOD AND DRINKS: A CASE STUDY, *Journal of Security & Sustainability Issues* 9
- [31]. Ponnampereuma, F.N. (1984). Straw as a source of nutrients for wet land rice, 117-136. *Organic Matter and Rice*. International Rice Research Institute. Los Banos, Philippines
- [32]. Saothongoi, V. et al. (2014). Effect of Rice Straw Incorporation on Soil Properties and Rice Yield, *Thai Journal of Agricultural Science* 2014, 47(1): 7-12
- [33]. TTH Ha et al. (2019). Modern corporate governance standards and role of auditing-cases in some Western european countries after financial crisis, corporate scandals and manipulation, *International Journal of Entrepreneurship*, 24(1S)
- [34]. VQ Nam, DT NGOC HUY.(2021). Solutions to Promote Startup for the Youth in Minority and Mountainous Region of Thai Nguyen Province-Vietnam, *Journal of Contemporary Issues in Business and Government* 27 (3), 2113-2118
- [35]. Binh, V. T., & Huy, D. T. N. (2021). Further Analysis on Solution Treatment for Diabetes of Patients at Hospitals in Vietnam. *NeuroQuantology*, 19(8), 88-93
- [36]. Yao , S et al. (2015). Effects of rice straw incorporation and tillage depth on soil puddlability and mechanical properties during rice growth period, *Soil and Tillage Research* Volume 146, Part B

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