

Farmers' Needs to Cope with Flooding in Waw Township, Bago Region

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DOI: 10.29322/IJSRP.9.09.2019.p9325

<http://dx.doi.org/10.29322/IJSRP.9.09.2019.p9325>

Abstract- Farming is a great way to describe the lifestyle and work of people whose jobs are in the agriculture industry. Waw Township, lowland area, is located in southeastern part of Bago Region. Sittaung River and Khamon Myitkyo Chaung pass through Waw Township. It has an area of 952 square kilometer. It has 185514 acres of cultivated land. Paddy cultivated land is 185287 acres. This is the second most paddy cultivated land after Kawa Township which is larger than Waw. Waw Township has often been experienced by flooding.

In Waw Township, flooding is caused by process such as flat areas being flooded by heavy rainfall. More than half of all paddy fields (more than 100,000 of the estimated 170,000 acres of paddy) were damaged. Therefore, Aim of the paper is to point out what farmers' need to cope with flooding on agricultural production. Objectives of the research are to study how many farms are damaged and to examine how farmers cope with flooding on agricultural production. The researcher selected 1 ward and 3 villages which are flood prone areas in Waw Township. They are Kantaw Ward, Waing Pat, Da La Nwan and Sin villages. These selected areas are located on the western part of Sittaung River. Semi-structured questionnaire and in depth interview method are used to study.

Simulation model of Hatch et al., 1974 is applied to determine the effects of selected factors on the survival capability and the growth of farms under conditions of risk and uncertainty. The farm sizes vary from 6 acres to 54 acres, the operation was represented for full owners and part owners. The result shows that goal hierarchy of the farmers is related to farm and farmer characteristics such as age, tenure and experiences.

One major constraint for farming in Waw Township is lack of access in credit in time to purchase seeds and fertilizer, and to practice in time. Inadequate amount of credit and lack of access to credit impose heavy costs on agriculture in terms of productivity and income (Turnell 2008). This situation is also found in the study area.

Index Terms: farming, simulation model, survival capability, farm characteristics

I. INTRODUCTION

What are farmers' needs to cope with flooding on agricultural production? This is the actual problem for the farmers who encounter the flooding over their farmlands. Flooding often occurs in Bago Region, especially in the townships on the western part of Sittaung River. Farmers in Waw Township also encounter the flooding over the farmlands every year. Severe in 2018, all the farmlands are damaged by the heavy rain in July and August. Therefore, researcher wants to examine how they sort out for survival capability and the growth of farms, what is the goal hierarchy of the farmers in this environment and uncertainty and what the needs. To find out the solution, questionnaire survey and interview method are used. To analyse the variables Simulation Model of Hatch et al., 1974 is applied.

II. THEORETICAL DISCUSSION AND HYPOTHESIS

A. Theory and conceptualization

In the Western world, simulation models have also been adopted to evaluate possible alternative strategies of the farm firm under conditions of risk and uncertainty (Johnsson, 1874; Hatch et al., 1974). The former, in a study of European agriculture, developed a behavioural approach on the assumption that farm managers are more likely to look for solutions which satisfy a hierarchy of goals than to seek optimal solutions to their problems. This necessitated an understanding of farmers' goals and the proposed simulation model, designed to evaluate the consequences of random variations in the farm environment, appeared to work well in the cited examples.

A similar simulation exercised by Hatch et al.(1974) attempted to incorporate multiple goals into the study of decision-making processes of Texan farmers. The proposed model attempted to identify a hierarchy of goals and thus assumed that such a hierarchy existed and that each goal in the hierarchy had a quantifiable satisficing level. More specifically, the model was designed to determine the effects of selected factors on the survival capability and the growth of dryland and irrigated farms in the south central Great Plains. Seven factors were considered to be of major importance: goals of the farmers; initial tenure status; yield variability; consumption by the farm family; land requisition alternatives; initial farm-size and availability and cost of irrigation water.

The actual model developed by Hatch et al. (1974) had three objectives: estimate a hierarchy of goals; evaluate a specified set of plans; and choose between alternative plans, taking into account the estimated goal hierarchy. A list of 8 goals such as “control more acreage by renting or buying, avoid being forced out of business, maintain or improve the family’s standard of living and avoid years of low profits or losses” etc. was placed in ranked order by the farmers, from which scalar values were estimated for each farmer. These were regressed on various farm and farmer characteristics, including age, tenure and education. The simulation model was then used to compare the rate of growth for representative dryland farm situations in the study area.

In relation to the hierarchy of goals, results showed that to make “the most annual profit” was a dominant goal about 38 per cent of farmers. Its relative importance is the goal of “increasing net worth” and was dominant about 32 per cent.

This model is the most appropriate because farmers in Waw Township are more likely to satisfy instantly the present situations than to look for the finest solutions to their problems. In this paper, researcher studies a hierarchy of goals of farmers, and farm and farmer characteristics. Farmers’ needs to cope with the flooding on their farmlands are tried to find out.

B. Main hypothesis (ses)

To examine a hierarchy of goals of farmers is the same in an area, and to compare and identify the situations; farmers’ behaviours are studied on the basis of the size of the farms and their age. Goals of farmers in Bago District are “control more acreage by renting or buying, avoid being forced out of business, avoid years of low profits or losses, increase time off farm farming (leisure time), increase net worth from farm or off-farm investments”. These were regressed on farm and farmer characteristics.

III. IDENTIFY RESEARCH AND COLLECT IDEA

A. Type of research design

Researcher is conducting causal research design to identify the hierarchy of goals of farmers regressed on farm characteristics. Quantitative and qualitative data are used. Causal studies usually offer the advantages of replication if necessity arises.

B. Scope of the research

The research will study the effect of farm and farmer characteristics in Waw Townships in 2018.

One ward and 3 villages located near Sittaung River are selected as the study area because these are flood prone areas of Waw Township. Farm sizes are chosen between 6 acres and 54 acres.

C. Operationalize the variables

Independent variables of farm and farmer characteristics used in this study are age of the farmers, education, tenure, initial tenure status, years of farming experience, farm income, off-farm income, assets, acres of owned land and proportion of land owned (land owned (% of agricultural land/arable land). Dependent variables are number of dependents, consumption by the farm family, debts, leisure time and reduce borrowing needs.

D. Data collection instruments and techniques

Secondary data such as regional facts and maps are recorded from the Administrative Office of Bago Region and MIMU. Primary data such as goals of farmers and their characteristics are collected by questionnaire. In regard to survey data 28 farmers are interviewed to get general and detailed information. Stratified sampling technique is used. Questionnaire includes 22variables.

E. Research Design

What farmers’ needs to cope with flooding on agricultural production

↓
Study on 2018 flood prone areas in Waw Township, Bago District

↓
Farm situations of full and part owners

↓
Farm and farmer characteristics
(Capital, loans, policy, age, tenure, experiences, off-farm works etc.)

↓
Semi-structured interview and in-depth interview

↓
Comparative study with Simulation Model of Hatch et al., 1974

(to make the most annual profit was a dominant goal about 38 per cent of the farmers/ the goal of increasing net worth was dominant about 32 per cent)

Fig 1: Research Design

Source: Researcher's study on literature and field survey in 2019

F. Model testing and statistical Analysis

Hierarchy of goals of farmers will be interpreted by the data collected in the study area and then compare the result of the model. Research design is shown in Fig (1).

IV. RESULTS AND FINDINGS

A. *What farmers' needs to cope with flooding on agricultural production*

How farmers cope with natural disaster and what they need

Bago Region is one of the important regions for agriculture in Myanmar. Natural disaster, flooding, occurs in Waw Township in Bago District every year. More than half of all paddy fields were destroyed as a result of heavy rain, according to residents and officials in 2018.

Location and extent

Waw Township is located in the southern part of Bagon District, Bago Region. It is located between North Latitudes 17° 20" and 17° 44" and East Longitudes 96° 33" and 96° 54". It has an area of 376.7 sq.ml.

Topography

It is a flat land and flooded low-land area. Waw Township has many streams. The important streams are Waingyoe Chaung and Bago-Sittaung Canal. It is located 23.8 ft above sea level.

Climate

Its climate is hot and wet. The maximum temperature is 39° C and minimum is 25° C. There are 106 rainy days in 2015, 125 days in 2016 and 132 days in 2017. It increases yearly. Total rainfall is 147.46 inches in 2015, 145.43 inches in 2016 and 127.97 inches in 2017.

Agriculture

Total cultivated land is 185498 acres in Waw Township. Le land is 184457 acres and garden land is 1041 acres. In 2018 summer paddy cultivation is 12606 acres, winter groundnut is 7376 acres, and cultivated areas of other pulses are 120, 126 acres. Vegetable is 2071 acres.

Natural Disaster

Waw Township is located in 23.8 ft above sea level. It is low-land area and usually affected by the flood. In rainy season, villages beside Sittaung River are flooded due to the water flowing of Bago Yoma. Important water level of Bago-Sittaung Canal is 675 cm.



(a)



(b)

Photos: (a) Flooding in Sin Village and (b) Damage of Myitkyo-Kyunsu Bridge in Waipat Village Waw Township on 29.7.2018

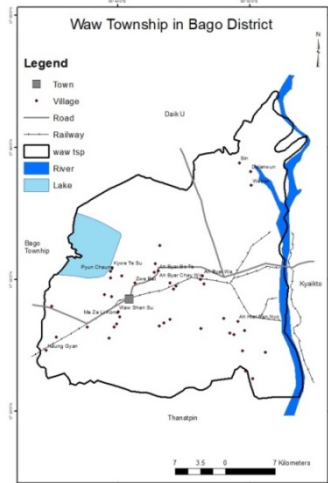


Figure 2: Waw Township in Bago Region

Source: Based on the map of Local Administrative Department, Waw

Waw Township is frequently hit by natural disaster such as flood and riverbank erosion. Each of these has impact on the livelihood of agricultural population to a great extent almost every year. Local farmers have always experienced some degree of flooding. The researcher selected 1 ward and 3 villages as the case study. They are Kantaw Ward, Waingpat, Da La Nwan and Sin villages which are flood prone areas in Waw Township. These selected areas are located on the western part of Sittaung River.

B. Agricultural production in flood-prone areas in Waw Township

Data and Definitions of the Variables

The data used in this empirical application is random sample surveys conducted in January 2019 Waw township of Bago District. A total of 40 farm households were interviewed. Information from these farm households were gathered using a structured questionnaire. Additional survey data were obtained from the local office of Myanmar Agriculture Service of the Ministry of Agriculture and Irrigation. The data include tenure status, years of farming experiences, off-farm job, assets and debts as well as household demographic characteristics. Data on rice farming activities include fertilizer and pesticide application, harvesting, and so on. Income and capital assets were also collected. Farmers in Waw Township are mainly cultivating rice and pulses. The major second crop is a variety of pulses such as Groundnut, "Pelinphyu and Pedisein".

Farmers in Waw Township grow rice in rainy season. Table 2 describes the selected characteristics of sample farms. Output is measured in tin of rice per acre. The mean rice yield over the sampled farms in Waw was 26.63 tin/acre with a range of about 15 tin/acre to 60 tin/acre.

The cultivated land is measured in terms of rice grown area per household. Total cultivated land area is different in started time and the present. The total labor expenditure per farm includes the costs of family labor to hired labors for growing period.

The farm level specific prices differ a little across the farms due to their product quality. Input prices are not different since most of the companies come and distribute fertilizer directly to farms in the study area.

Farm and household characteristics variables that are used in the estimation of profit inefficiency index include the age, experience and educational level of household head, dependents, off-farm income and leisure time (Table 1 and 2).

Table 1. Selected Characteristics of Sample Farms in Waw Township

Farm and Household Characteristics	Minimum	Maximum	Mean
Age	42	74	54
Experience (yr)	3	54	21.27
Education of the head (grade)	4	10	7
Off-farm work	0	4	1.27
Number of family	2	8	5.82
House size (sq.ft)	288	1470	838.8

owned material (tractors)	1	2	1.2
owned animals (number)	2	8	5.25
output rice (tin)	15	60	26.63
output pulses (tin)	10	20	7.5
Farm income (MMK)	2	50	25.18
Off-farm income (MMK)	1	20	6.25
motorcycle (number)	1	4	1.18
leisure time (no. of months)	0	4	2.54

Notes: Off- farm work: odd job is 1, salary is 2, own job is 3, own business is 4
Source: Field Survey in 2019

Production of secondary crop is obtained after the rice production. It is assumed that farmers who devote more of their time and resource allocation in second crop production have lower efficiency than would other producers who pay much effort and time on rice production.

Formal credit, in a proper use in production, increases the net revenue that is obtained from fixed inputs, market conditions, and household characteristics. Informal credit, however, with higher interest rate reduce net revenue for farmers. Credit constraints, on the other hand, might decrease the economic efficiency of farmers especially during the time for planting and harvesting. These effects will be affected only for the farmers who are in need for credit.

For representing the characteristics of farm manager, age and education of household head are included in the analysis of the determinants of profit inefficiency. Another determinant factor for household characteristic is education of household head, and it is hypothesized to have positive effect on efficiency.

Table 2. Farm Characteristics of A Sample Farm in Sin Village, Waw Township

Farm Characteristics	Number
Age	53
Farm size (acres)	6
Initial farm size (acres)	6
Experience (year)	20
No. of Farm family	8
Education (Grade)	4
Farm workers in family	3
Number of dependents	3
Consumption of farm family (Lakh)	2
Off-farm work (number)	1
Off-farm income (Lakh)	1
Farm income (Lakh)	4.8
Assets	0
Debts (Lakh)	0
Leisure time (no. of month)	2
Pulses Yield (tin/acre)	13
Making most profit	1
Distribution place	2

Source: Field survey in 2019

Note: Education (G1-G4 = Primary, G5-G8 = Middle and G9-G10 = High School Level), Tenure (1 for tenant, 2 for partly own and 3 for own), off-farm work (1 for odd job, 2 for labor, 3 for shopkeeper and 4 for entrepreneurship), Assets (0 for hire machines, 1 for own machine and warehouse, and 3 for luxury such as cycle, motorcycle and 4 for motor car), making for most profit (1 for basic needs such as seeds, fertilizers and

pesticide, 2 for getting weather information, 3 for studying the suitable seeds) and Distribution place (1 for local, 2 for neighbouring township and 3 for other places)

Education as a role of human capital mainly referred to as allocative ability stems from the fact that caring the growing rice fields, waiting the planted time, selecting the seeds that can be cultivated in the deep-water, cultivating only the second crop, pulses, in response to changes in weather conditions gathering, retrieving, and examining critically on useful information on those changes, and to bring effective decision from the information in hand, and proceeding without hesitation. Allocative skill, therefore, as human capital in that sense, that it is acquired at a cost and tend to yield a valuable stream of services over future periods. That skill is gained in schooling, by getting information, and in experience.

Age of the household head or farm manager is included to represent general decision-making ability. Schultz (1975) argued that education is likely to be more effective than the better location of farm exists. Farmers who have poor access to markets have less incentive in profit maximizing activities compared to those farmers who have better access to markets and their farms locate near cities. All of above-mentioned variables affect the efficiency of farm production.

C. Findings

In Waw Township, a list of 8 goals such as “control more acreage by renting or buying, Avoid being forced out of business, maintain or improve the family’s standard of living, off farm farming” etc. was placed in ranked order by the farmers, from which percentage values are shown in Table 4.

In relation to the hierarchy of goals, results showed that to make “the most annual profit and reduce borrowing needs” were dominant goals about 81 per cent of farmers. Its relative importance is the goal of “off farm farming” and was dominant about 54 per cent (Table 3 and 4).

A hierarchy of goals of farmers is the same with the finding of Hatch (1974) is that “the most annual profit” was a dominant goal. However, its relative importance is the goal of “increasing net worth”.

Table 3 Simulation of dominant goals observed for farm situations, flood-prone farmlands of Waw Township (percentage)

<p>Goals</p> <ol style="list-style-type: none"> 1. Control more acreage by renting or buying 2. Avoid being forced out of business 3. Maintain or improve the family’s standard of living 4. off farm farming 5. Increase net worth from off-farm investments 6. Reduce borrowing needs 7. net profit outside the farming 8. Make the most profit 9. No leisure time 	<p>Farm and farmer characteristics</p> <ol style="list-style-type: none"> 1. Age 2. Education 3. Tenure 4. Years of farming experience 5. Number of dependents 6. Off-farm income 7. Farm income 8. Assets 9. Debts 10. Net worth 11. Land operated 12. Acres of owned land
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Source: Based on Simulation Model of Hatch et al., 1974 and the need of field survey in 2019

Table 4 Simulation of dominant goals observed for farm situations, Waw Township, Bago District (percentage)

Goals	2019 (percentage)
1. Control more acreage by renting or buying	36.36
2. Avoid being forced out of business	45.45
3. off farm farming	54.55
4. Increase net worth from off-farm investments	9.09
5. Reduce borrowing needs	81.82
6. net profit outside the farming	36.36
7. Make the most profit	81.81
8. No leisure time	27.27

Source: Field survey in 2019

Farmers’ coping strategies to flood

Awareness of flood helps farmers to select coping strategies to be practiced. Analysis of the data reveals that farmers of the flood affected areas were aware about the occurrence of flood from mass media (radio, television, newspaper). Other strategies are idea of old and experienced person, warning of local administration and aware of rapid fluctuation of temperature.

In Waw Township, flooding occurs yearly and water level usually increases to 4 ft. In 2018 water level increases to 7 ft. and all rice fields are flooded and damaged. All respondents were highly aware about the flood and they select the seeds to endure.

Findings also indicate that majority (70 percent) of the respondents were highly aware about the occurrence of flood. Awareness enhances the farmers to take decision about the practices of coping strategies. However, this year all rice fields are destroyed and consequently, they cultivate pulses after flooding.

Crop production

Crop productions are seriously and or somewhat hampered in every flood occurrence in Waw Township. All of the rice fields are damaged in 2018. From their previous experiences farmers practice a lot of coping strategies.

“Many paddy fields are damaged and they were being prepared when the heavy rains started on June 13. However, the fields are now flooded and we can’t plant” said U Tin Win, a farmer from Waw who lost 8 acres of paddy seedlings with which he planned to sow 50 acres.

Pre- flood period

Some of the coping strategies followed during the pre-flood period are that coping strategy like ‘storing the seeds’ ranked first and ‘changing the alternative seeds’ i.e. more endure the flooding ranked second followed by ‘maintaining the cropping land during flood and ‘cultivating again the alternative crops ranked third and fourth respectively.

Post-flood period

Caring the cropping land after flood period is also important. For the next cultivation, people might face problems due to inadequacy of seeds, seedlings, saplings, fertilizer etc. Some of the coping strategies followed after flood period are that coping strategy like ‘sowing quick growing seeds’ ranked first and ‘cultivating of pulses instead of rice’ ranked second.

The most suitable coping strategy is practicing like ‘fisheries in farm land’.

V. CONCLUSIONS

Bago Region is located in the southern part of the country. Flooding is one of the most affected natural disasters in Bago Region because of many rivers and streams flowing in the region and being the low-lying area.

Waw Township is located in Bago Region and a focal point for major economy of the region. Agriculture and animal husbandry are the primary occupations. It is located on Yangon-Mawlamyine highway road and good for transportation and communication. Its major product is rice.

However, the farm lands are flooded every year. Farmers are unable to replant their crops during the region’s main planting season in October due to agricultural land still damaged by the flood, and a lack of agricultural materials like seeds and fertilizers, according to interviews.

Some of the coping strategies are changing the alternative seeds, maintaining the cropping land, cultivating pulses again, sowing quick growing seeds and cultivating the seeds enduring the flooded such as long stem plants.

Damage caused by the flooding makes considerable impacts on the living standard of household and adversely effects on health and food security.

One major constraint for farmers in Waw Township is lack of access in credit in time to purchase seeds, fertilizer and to practice in time. There are a number of credit sources in rural areas with different terms and conditions. Farmers can borrow MMK 250,000 per acre directly from Myanmar Agriculture and Development Bank (MADB) with an interest rate of 0.67 percent.

Another important thing is that farmers cannot get the loans in time i.e., they needs credit in May, but MADB gives in July. Therefore, farmers have to loan the necessary capital from private and the interest is between 5 percent and 20 percent. Farmers cannot escape this situation and they are victims of the bad management system of the officials (field survey in Jan 2019 in Bago District).

Inadequate amount of credit and lack of access to credit imposes heavy costs on agriculture in terms of productivity and income (Turnell 2008). This situation is also found in Myanmar.

Therefore, farmers are automatically forced to get credit from informal money creditor, traders, fertilizer distributors and mortgage shop. Their interest rates are about 5 to 20 percent per month. The high interest might increase farmers’ debt and farmers are encountered more and more difficulties to continue.

Suggestion

Government needs to arrange the bank loan to farmer in time of the starting period. They want to get the loan in May for autumn crop and in October for winter crops.

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