

CHAPTER VII

CONCLUSIONS AND RECOMMENDATIONS

This chapter presents conclusions and recommendations of this research. These conclusions were based on findings of factors affecting the adoption of soil conservation measures using organic materials in oil seed crops-based farming systems and problems faced by farmers in using organic materials for soil conservation. The recommendations are also given for the improvements of the adoption in using organic material for soil conservation in the study area.

7.1 Conclusions

Magway township of the central Dry Zone area was conducted as study area in 2010. According to the sample households (165) in the study area, most of the cropping activities are concentrated during the rainy season and almost all of the households rely only on rain fed condition. Base on the information of survey, most of the farmers in this area grow oil seed crops and the main oil seed crops for this area are sesame and groundnut. The major cropping patterns of this area were the oil seed-legume cropping pattern and intercropping with pigeon pea. Some farmers adopted not only oil seed-legume but also rice-rice cropping patterns if they accessed irrigation. Some farmers adopted not only oil seed-legume but also vegetables if their farms were located on the both sites of river bank.

Among the sampled households, 88 farmers (53 per cent) adopted soil conservation using crop residues; 62 farmers (37 per cent) adopted soil conservation

using compost and only 25 farmers (15 per cent) adopted soil conservation by growing green manure. Among the sampled respondents, 163 households adopted the oil seed-legume cropping pattern, 157 households adopted the oil seed-cereal cropping pattern and only 5 households adopted the oil seed-vegetable cropping pattern. About 42.9 per cent of total crop biomass per hectare were using for fodder and 19.8 per cent of total biomass per hectare were burning. Only 37.3 per cent of total biomass per hectare were using for soil conservation. This was not surprising because incorporation of these organic materials had to be done during the peak period of labor utilization as it coincided with the other agricultural activities, such as land preparation and crop establishment. There was also some limitation such as fodder and fuel scarcity.

The objectives of this study on the adoption of soil conservation using organic materials were to determine farmers' knowledge on soil conservation measures using organic materials, to identify problems and constraints faced by the farmers in using organic materials for soil conservation measures, and to determine factors affecting soil conservation measures using the organic materials in the study area. This study would provide some information to government organization and non-government organizations intended to develop the Dry Zone of Myanmar. In addition, extension officers also would find the necessary information for the soil fertility improvement and conservation by using organic materials; crop residues application, compost application and growing green manure.

Using questionnaires to test farmers' knowledge on soil conservation practices, only 2.4 per cent of the sampled farmers had a high score level of knowledge. The farmers with high score level of knowledge were rich resources.

They had knowledge (local or traditional and scientific) on soil conservation, soil degradation and erosion. Moreover, they knew the ways to prevent and to improve if their soils had some problems such as degradation and erosion. And then they had more farming experiences and got more training. However, these kinds of farmers were a few percentages. The remaining 81.2 per cent of farmers had a medium score and 16.4 per cent of farmers had a low score level of knowledge on soil conservation, soil degradation and soil erosion status. The farmers who had medium score did not know which factors affected the soil erosion and soil degradation. Therefore, they made some improper practices such as post harvest ploughing that could lead to soil erosion. However, the farmers who had low level of knowledge only knew the advantages of incorporating with farm yard manure and intercropping and rotation for soil fertility improvement and maintenance.

The major problems faced by farmers in using organic materials for soil conservation in the Dry Zone area are: “insufficient moisture”, “lack of investments for using organic inputs” and “insufficient fodder and fuel”. In the Dry Zone areas, water is the major limitation factor for crop production and normally plant yields are reduced more by a shortage of soil moisture. Myanmar Dry Zone agriculture is heavily dependent on the monsoon rain. Farmers are facing uncertainty of rain and lack of irrigation water. The heavy reliance on monsoons is a major handicap for this region’s agriculture. Under these conditions, efficient use of limited water is of paramount importance. The dry agricultural land needs good management practices, since the soil is mostly sandy. The general decrease of crop productivity means also less amount of animal feed production, less production of manure or compost and thus, fewer nutrients are returning to the soil.

According to the survey and expression by respondents, major limitations for the non adoption of soil conservation using organic materials were as follows:

- 1) not enough fodder for cattle
- 2) need for cooking as fuel
- 3) not enough materials or equipments
- 4) not adequate labor resources
- 5) not enough water
- 6) no time to make them
- 7) laborious
- 8) lack of much knowledge about the soil conservation using organic materials
- 9) not willing to invest for long term conservation
- 10) no space for no monetary crops, such as green manure crops

As a result of the logistic regression model, there were eight independent variables that affected the adoption of soil conservation using crop residues in the study area. The four independent variables; age, amount of crop residues used as fodder, knowledge and oil seed-cereal cropping pattern were negatively related to the adoption but the other four independent variables; total farm size, soil type, farm income and oil seed-legume cropping pattern were positively related with the adoption of soil conservation using crop residues.

On the other hand, there were nine independent variables that affected on the adoption of soil conservation using compost. Although four independent variables; cropping intensity, oil seed-legume cropping pattern, partial irrigation access and number of cattle owned were negatively related, the other five independent variables;

age, education, amount of crop residues used as fodder, knowledge and extension visit were positively related with the adoption of soil conservation using compost.

For green manure growing, there are six independent variables that affected on the adoption of soil conservation. While farming experience, farm income and off-farm income were negatively related, the other three independent variables; total farm size, good irrigation and extension visit were positively related with the adoption of growing green manure for soil conservation.

Currently soil fertility management and conservation practices are insufficient to curb the soil nutrient mining and physical degradation hazards and its ensuring problems of food insecurity and poverty facing farmers in the Dry Zone area. Solution to the problems of the Dry Zone of Myanmar should then be sought within this range of limitations which, among several others, are a serious constraint to sustainable development. Within this context, solutions able to tackle the problem of soil and the general degradation of dry lands should be thought carefully, taking into consideration the entire array of components that are making-up the farming systems, the thorough analysis of the dynamics of a rapidly changing environment and, as a consequence, of the existing social patterns.

There is also insufficient information on cropping patterns, accessibility to inputs, coping strategies, grazing rights, knowledge on settled agriculture and livestock rearing, potentials and /or replicability of traditional soil and water soil management techniques. These kinds of information are essential to define major constraints affecting rural communities living in the Dry Zone and find appropriate solutions. The absence of soil conservation policies and strategies is one of the main reasons for most of the problems mentioned above. If conservation programmes are to

be effective, every effort must be made to develop practices which not only conserve the soil but also provide short-term, tangible benefits to farmers.

Therefore, obtaining farmers adoption of soil erosion-control practices will require the use of various implementation tools such as education, subsidies, and technical assistance. Teaching and extension efforts may need to be specifically designed to reach these upland farmers to further improve their understanding of the soil erosion problem and get adapted to erosion-control structures on their farmlands.

7.2. Policy recommendations

Base on the findings of this study, policy recommendations dealing with soil conservation can be made as follows;

(1) Agro forestry trees should be promoted by growing along the fences for fodder during the dry periods. Many agro forestry tree species supply nutritious, often protein-rich fodder for livestock (e.g. *Acacia albida*, *Leucacena leucocephala*). Small scale farmers with few livestock can use the leaves, twigs, and pods of these agro forestry species to increase outputs from their animals. During dry periods, when feed for livestock is scare, trees continue to produce fodder.

(2) Instead of using crop residues for fuel, measures to promote alternative fuel resources as a substitute fuel (fuel sticks and briquettes made from paddy husk and saw dust, etc.) should be strengthened. Unless alternative sources of fuel are provided, the amount of crop residues used as fuel will be increased. Because the rural poor, having no other alternative sources of energy for cooking, rely only on crop residues or fuel wood collected from adjacent

degraded forests and are extending their collecting into other unclassified forests.

(3) Irrigation system through the river pumping should be improved. Because it cannot be altered the unreliability of the rainfall, nor the fact that unpredictable rainfall and the occurrence of droughts are inevitable. As a rainfall deficit is always present in the Dry Zone, a drought manifests mainly in dry lands. Therefore, integration of organic residues into the soil is limited.

(4) Farmers' knowledge should be improved by the Extension Institution classify objectives and information and extension problems needs according to the target audience level of knowledge, attitude and practices and encourage the farmers to increase the adoption of improved technologies in an appropriate manner. Some demonstrations relevant the soil conservation technologies should take place in small areas until clear evidence on positive effects on conservation and increased productivity can be obtained.

7.3 Recommendations for further study

This study was conducted in only one township; it would be more representative of the Dry Zone area to study the effect of factors affecting soil conservation measures using the organic materials in other townships. The other weak point of this study is that there is no calculation of opportunity cost because of time and financial limitation. Therefore, further study should be analyzed the opportunity cost for the adoption of soil conservation measures using organic materials.

There is a need for further research related to issues such as study on dry land resource management and farming system development. Research activities for

problem soils, amelioration and soil fertility investigation in farmers' fields also should be undertaken.



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