

CHAPTER 6

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Description of coconut cultivation

Out of the surveyed smallholders, 82 farmers (47 percent) were monocropping coconut smallholder farmers while 69 farmers (39 percent) and 24 farmers (14 percent) were intercropping and livestock integration smallholder farmers respectively. There was heterogeneity within and between coconut-based farming systems.

According to the findings of demographic characteristics, the smallholder farmers were educated (10 years in schooling), experienced (30 years) and old (54 years) farmers and part time farmers (67 percent) were higher than full time farmers. More than 90 percent were male farmers.

The location of the farm ranged from one to 18 km with a mean of 5 km. The average size of the field was 3 acres. At present the field size is very small due to blocking and fragmentation of coconut cultivations in order to provide the space for houses, industries and other needs of the rapidly increasing population. Majority of the fields were medium (70 percent) in soil fertility as viewed by farmers. The most popular recommended coconut variety among the smallholder farmers was CRIC 60 since this can tolerate range of conditions and recommended for commercial cultivation. Out of all, 29 percent farmers did not fertilize the field by chemical or organic means. Vacancy filling was practiced by 73.7 percent to maintain the plant

density of 60-70 palms per acre. The extended and underplanted field percentages were 6.9 and 19.4 respectively. Some farmers were reluctant to do underplanting due to labour requirement and time limitation. Moisture conservation was applied by 61 percent of farmers and non chemical pest control was used by 20.6 percent farmers to control red weevil and black beetle damages.

When socio-economic characteristics were concern, farm income and off-farm income varied considerably due to different production and management practices and off-farm opportunities they employed. Out of the total 175 farmers only 24 percent accessed to subsidy and only three farmers gained credit. There was a higher variation of receiving extension contacts with a mean of 2.55. Only a few trainings (0.35) had obtained by the farmers for 3 years and only 33 percent had received trainings on coconut cultivation practices. The officers told that most of the smallholder farmers are reluctant to participate for trainings and they did not apply for those and farmer viewed that they were not invited for trainings.

Coconut related organizations are not functioning well in the district and most of the farmers were not aware of these. Extension and printed media by CRI and CCB were the popular information sources among smallholder farmers to gain new farming technologies. Out of total 28.57 percent of farmers did not receive extension contacts because they have not informed their problems and some of the fields were not having considerable problems. Some farmers told that the officers visit only to the subsidized fields. According to the authority at present there is a shortage of officers (CDO) in CCB and one officer is responsible for more than 6,000 acres area and it is difficult to visit each and every farmer field. Beside that 22.9 percent of the smallholders have

used their own experience for coconut cultivation because farmers have more than 29 years experience in average.

Majority of the farmers (49.7 percent) were able to manage the cultivation without credit and some mentioned that they were reluctant to obtain credit due to a burden and responsibility, inability to repay, problem of deed, need of collateral and small size of land.

Coconut land improvement subsidy schemes are available for coconut growers. But majority of the surveyed farmers have not been benefitted by that. Out of the studied farmers only 24 percent had taken subsidies because some could manage without subsidy and others did not access to that due to more documentation (need to fill many applications), no proper land right and small land size. Out of the total 20 percent of the farmers were not aware of the subsidy scheme and about 3 percent have recently applied for fertilizer subsidies.

Coconut fertilizing, harvesting (plucking) and collecting are the most labour consuming field operations. At present there is a labour shortage for harvesting (climbers) due to social stigma of younger generation to do this job. There is no marketing problem for selling of coconut because farmers can sell their product at the farm itself to intermediate traders. The nuts are sold as husked or as de-husked nuts according to the farmer and buyer requirements and de-husked nuts are normally 2-3 rupees less in price than husked nuts.

6.1.1 Comparison of different coconut-based farming systems

Coconut monocropping has been identified as an inefficient land management system of low productivity and poor economic returns comparatively with other

systems. According to the survey results more than 50 years old farmer percentage and more experienced percentage were higher in diversified systems than monocropping. Therefore the experience gained with age has been useful for smallholder farmer to diversify his field with crops and livestock. Moreover, there was not a vast difference in full time and part time farmer percentages among all three systems. But part time farmer percentage is slightly higher in intercropping system (70 percent). Therefore that may be the reason for more hired labour utilization in all three systems than that of family labour . When considered off-farm income, that was also not much differ within three systems. On the other hand total farm income was comparatively higher in intercropping and livestock integration systems than monocropping. Due to this condition it can be concluded that off-farm income and fulltime farming have not played a big role to adopt diversified systems. Smallholder farmers in diversified systems may have been used their farm income to employ in diversification while using off-farm income for other expenses. But the least farm income gained by monocropping farmers may not be sufficient to improve their system towards diversification and they have used their off-farm income too for other expenses. On the other hand monocropping farmers complained about labour scarcity and land limitation to adopt sustainable systems. A reason for this may be the location of monocropping fields was more closer to a main city than other two systems and land fragmentation and off-farm opportunities are higher due to that resulting in above limitations which are vital for diversification according to the observed results (hired labour utilization and size of the field were higher in diversified systems than monocropping system). Beside that it was obvious that percentage of farmers gained subsidy and extension contacts were comparatively lower in monocropping system.

Those conditions too may have been disadvantageous for them for not employed in diversification.

When farmers in monocropping system apply land improvement sustainable technologies such as any type of fertilizer application, moisture conservation and vacancy filling the yield has been increased. It was obvious that higher the number of sustainable farming practices applied better the yield and income of coconut per unit land area in monocropping system. On the other hand, when more practices in the field are carried out it needs more labour and cost of cultivation can be increased too but the net farm income has been increased comparatively with the number of applied practices. According to the farmer view of soil fertility condition of the field that has been increased with the application of the practices resulted in higher yield. Therefore if the farmer is unable to adopt the intercropping and livestock integration sustainable technologies, farm productivity and fertility can be increased by the application of above mentioned practices to improve sustainability of the monocropping field.

The smallholder farmers belong to the intercropping system have diversified the system from 11 years in average. In average 55 percent of the total plantation has been allocated for intercropping. Altogether 15 types of intercrops were observed in the intercropping coconut based system and most of the smallholder farmers in this system have grown perennial and semi perennial crops which need less management practices. Banana and pepper were the popular intercrops among them because those have higher demand with better commercial value.

According to the farmers the main advantages of intercropping were soil fertility improvement, moisture conservation, weeds control and increase the coconut yield due to all these. Some of them told that if any tree can hear human voices, that

produces more fruits. Therefore frequent farmer and labour visits help to increase productivity of both intercrops and coconut. A few farmers negatively viewed this system due to competition for coconut after intercrops establishment. One reason for this may be that they have not fertilized the field properly and it created competition for nutrients.

In livestock integration system, farmers reared livestock with coconut and with or without crops. Common livestock reared in the system were cattle and poultry. In this system too, 11 types of other crops were observed in 75 percent fields. The highest economic return was observed in this system relative to the other systems. On the other hand labour utilization was highest in this system too because for rearing livestock needs more labour than maintenance crops.

All the smallholder farmers of this system mentioned that the main advantage of this on coconut production was the enhancing the addition of livestock manure to coconut. Besides that, weed control by cattle and gaining of different products for different types of markets were the other viewed advantages.

6.1.2 Problems faced by the coconut smallholder farmers

In general, smallholder farmers in all three systems face main problems such as labour scarcity, price fluctuation and financial difficulties to manage and improve their cultivations properly. Since the study area is semi urban most of the people are employed in industrial sector. Therefore the labour shortage is severe in this area with high wage rates. Almost all the younger generation in the farm family is employed in industrial sector. Moreover, there is no stable farm gate price for coconut and it fluctuates within and between years due to the yield fluctuation and variation of

demand with rapid increasing population. The cost of fertilization and labour cost have been creating financial problem to manage the cultivation.

Monocropping coconut farmers specially mentioned their constraints for not employed in diversification. The farmers in the monocropping system mentioned about different reasons for not adopting on diversification systems and out of all the main problem was limitation of space among palms due to small land size, unsystematic coconut planting and higher density than the recommended density in the fields. Secondly viewed problem was the labour scarcity and high labour cost. Financial difficulty was another problem to do diversification which needs more labour for different farming practices. Although the subsidies are given to farmer some farmers mentioned that they need to have cash in hand to do practices initially and if those are done according to the recommendation only they can reimburse that money through subsidy scheme. Some farmers were reluctant to access subsidy due to documentation, collateral and land right problems. Some were not aware of these may be due to poor extension contacts and social contacts.

6.1.3 Factors influencing sustainable coconut-based farming systems

The result obtained by ordered probit analysis showed that land size, hired labour, farm income, extension visits and soil fertility factors combined in factor analysis were the positively significant factors which influence sustainable coconut farming systems. Therefore it is important to take measures to improve soil fertility to enhance productivity and to obtain more farm income from existing land and labour. Then that will result in higher production per unit land and labour to improve the livelihood of farmer while achieving sustainable coconut cultivation to meet the

increasing demand. Extension service needs to play an efficient role by introducing integrated nutrient management techniques, and other technologies to improve productivity while introducing better subsidy schemes which are applicable within farmer's resource base.

6.2 Recommendations

According to the results obtained, the recommendations are summarized with the following points appear to be considered and implement for influencing the sustainability of coconut farming to improve the soil fertility and productivity with special consideration of smallholder cultivations.

At present the government of Sri Lanka has taken many steps to improve the production and sustainability of coconut cultivation by targeting new plantation of coconut for one hundred thousand acres of land area by 2020, prohibiting the fragmentation of coconut lands that are more than five acres in extent to save the coconut industry as the fragmentation of coconut lands has led to a drastic drop in coconut production, prohibiting of felling down of coconut trees and educating school children about the value of coconut industry other than the earlier introduced sustainable policies still there are some barriers to follow these to improve sustainability.

The study proved that by improving soil fertility condition the sustainability of coconut plantations can be improved by employing sustainable technologies. If extension service can provide more information on the benefit of integrated nutrient management (INM) for long term sustainability, smallholder farmers will apply both chemical and organic fertilizer together to improve field fertility. Farmers who do

livestock integration can easily follow INM with livestock manure and the farmers practicing intercropping too can adopt INM with chemical fertilizer by adding leaf litter of intercrops, compost and growing green manure crops such as *Gliricidia* to improve soil fertility and productivity. Although the smallholder farmers involved in monocropping may not be able to access to organic manure more possibly than other farmers, by applying land development and soil rehabilitation technologies such as moisture conservation, fertilization and vacancy filling can gain a long term better production with fertility improvement than solely do monocropping or pure monocropping. The results of this study too proved the benefit of adopting those technologies with monocropping cultivation for the farmers who are unable to apply diversified technologies to develop their monocropping coconut fields. Smallholder farmer has to allocate some financial resources for the application of farming practices with more labour. If government can support the farmer to improve the financial status that may be an advantage to adopt intercropping or livestock integration technologies and also to further improve the monocropping coconut fields to improve the soil fertility and productivity.

Provision of a sound scientific basis for the sustainable development of the coconut industry by developing appropriate intensified technologies which can be applied under the conditions of limited land and labour resources for coconut-based farming systems will enhance farmer adoptability since labor and land constraints limit the smallholder farmers' ability to invest in land improvement technologies. Further, according to the surveyed result the average age of the smallholder farmers in all three systems is more than 50 years. This means that younger generation involvement is not in a considerable level in coconut farming even though they can

obtain benefit from this since the nut price is increasing yearly. Therefore the youth including school children should make aware of this profitable cultivation while introducing low labour consuming new techniques for fertilizing and harvesting of coconut since these are the more labour consuming operations in coconut cultivation. Due to that people will be able to do coconut farming parallel with off-farm opportunities. Beside that they will consider that it is worth enough to keep coconut lands for long term benefit than selling those to get short term benefit.

The survey identified that majority of the smallholder farmers do need trainings and they were not invited for trainings. According to the view of authority farmers are reluctant to participate in trainings and they did not apply for trainings.

These ideas go in opposite directions and to meet them together extension officers should identify the required themes for trainings considering the needs of the area when organizing those trainings. Similarly, smallholder farmers should be invited for those trainings without waiting for their applications, making them aware through popular media.

Organizations directly related with coconut are not functioning in the studied area. That may be a disadvantage in accessing information related with coconut industry. If farmers can gain more information on different types of technologies, subsidy schemes, maintenance practices (pest and disease management, organic fertilization, etc) and knowledge and experience sharing with other farmers that may be useful to improve the system. Thereby it will be possible to share labour in participatory field work. Furthermore, farmer groups can invest on coconut processing (copra, desiccated coconut, coconut confectionaries etc.) with or without credit facilities as they wish to widen the market facilities with value added products. This

type of activity will create more employment opportunities within the coconut sector in the area while becoming a strategy to persuade younger generation more towards the sustain of the system. Therefore it is vital to take measures to reactivate coconut related organizations in village level or CDO division level to enhance the social capital to gain earlier mentioned benefit from that.

The study revealed that there are some barriers to obtain an efficient extension service due to inadequacy of field officers and claims provided to them. Since the officers are unable to obtain more travelling claims they frequently visit larger fields than small fields to show their continuous progress. Therefore to overcome these barriers and to achieve full benefit from extension service required amount of officers and financial resources should be allocated facilitating them to visit smaller sized fields too more often. Incentives should be given to enhance the efficiency of coconut field officers. Moreover, it is necessary to give the trainings for farmers building up farmer network and thereby the technology can be disseminated through the network instead of waiting for that by extension officer.

In overall, developing countries should have policies which ensure the development of sustainable agriculture for smallholder farmers. Land degradation and deterioration of agricultural productivity are major threats to smallholder farmers in developing countries. Following this concern, governments and other agencies have invested substantial resources to promote rapid dissemination of yield enhancing and soil conserving technologies. But results are so far not so positive because the adoption rate towards these technologies is low. Therefore the efforts should be geared towards some of the constraints or searching for appropriate technologies that suits the resource base of the farm households which could enable them to employ the

technologies by increasing awareness through extension service to obtain the expected benefit from those technologies.

6.3 New findings and limitations

Among the new findings, the smallholder farmers have used specified techniques and equipments to improve their coconut cultivation. Some farmers have used equipments for compost preparation and pruning of intercrops. One farmer has applied tea dust to manage pest problems in coconut. One farmer who could access more labour have provided with supports to heavy coconut bunches using coir threads to reduce falling down of nuts.

Although the results revealed that land and labour facilitate the coconut sustainability those are the limitations to improve the sustainability of coconut farming. While conducting the field survey some farmers were reluctant to provide their true information specially related to their income and it took more time to obtain that information with more reliability with more social and friendly contacts.

6.4 Further study

The study revealed that the benefit of soil fertility improvement and extension service to improve the sustainability of coconut farming since the land area and labour availability act as scarce resources. Therefore, further study should be needed to find out the soil fertility improvement technologies and new research work to develop integrated nutrient management (INM) practices. Further, identification of higher value intercrops and livestock breeds with coconut will also necessary to improve the

farm income of diversified farming and to attract more farmers towards coconut farm diversification.

Further, a study will also be necessary to explore the involvement of younger generation in coconut sustainable production and to obtain their views on newly introduced farming technologies to improve and do modifications if necessary.