

**CULTIVATION OF FRUITS AS ALTERNATIVE CROPS IN HAMBANTOTA DISTRICT:
POTENTIAL AND PROSPECTS**

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ABSTRACT

Alternative crops are considered to be one of the feasible solutions for common constraints faced by the paddy farmers. Therefore the present study was undertaken in Hambantota district of Southern Sri Lanka with the objectives of identifying and assessing the potentials and prospects of different fruits as alternative crops. Through a structured questionnaire, the primary data were collected from randomly selected Agricultural Instructors (AIs), Agriculture Research and Production Assistants (ARPAs) and farmers. Fruit cultivation in terms of alternate crops are found to be dominated by banana (68%) followed by papaya (8%), watermelon (6%), passion fruit (3.5%) and pomegranate (3.47%). The higher number of farmers per visits (>125 farmers/visit) made by the majority of Agricultural Instructors (AIs) (72%) has caused an inefficient knowledge dissemination. As a result, the majority of farmers (52%) have to depend on dealers for the pesticides usage followed by AIs and farmers' traditional knowledge. Moreover in order to popularize potentially available fruit crops, meeting the requirement of local seeds/ planting materials ought to be supplied with subsidy. Furthermore, implementation of few attractive financial inducements for the non – paddy farmers is vitally important. Water shortage, unavailability of storage facilities, lack of farmer involvement in processing and value addition of harvest, crop damage by wild animals are some of the identified constrains. Cultivation of fruits as alternatives crops could be achieved in Hambantota district through an integrated approach including effective means of knowledge dissemination, farmer supportive services and improved facilities for storage, processing and value addition.

Key words: Alternative Crops, Constrains, Fruit Crops, Hambantota District, Potentials, Prospect

INTRODUCTION

Being an agricultural country, majority of the Sri Lankan workforce (34%) is involved in agro-related livelihoods (Athukorala and Jayasuriya 2012). Paddy, the major crop in the country is recorded an annual production and land area up to 4.8 million t and 1.09 million ha respectively (CBSL, 2015). With the uncertainty of rainfall, the risk associated with paddy cultivation has become a matter of great concern. Floods, droughts, pest and disease incidences and price fluctuations are also considered to be risk factors in the paddy sector. Therefore, the dependency merely on paddy creates lots of economic, social and environ-

mental issues (Annon, 2008- 2010).

Owing to plenty of tangible merits, cultivation of alternate crops is considered to be one of the best options available for both the domestic and commercial scale farmers in Hambantota district. Instability of commodity prices excluding alternative crops, reduced farm subsidies, increased pesticide resistance of major pests, losses in genetic diversity and dietary pattern changes in consumers are found to be the other factors that could stimulate the interest in cultivating alternative crops (Sauer and Sullivan, 2000).

Cultivation of fruits as alternative crops might

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provide with additional markets or greater economic gains with compared to the other major crops. Some of the fruit crops are added to a rotation to break up insect and pest damage, disease cycle, to increase soil tilth and fertility or to clean up the weedy fields. Although alternative crops have been identified as one of the fine solutions to equip the paddy farmers with a better economic base alone with additional income to cater the environment in a friendly and sustainable manner and to utilize the available resources maximally and productively; still there is a certain gap of research knowledge on the selection and suitability of alternative crops to an area of concern (Moncarda *et al.*, 2010).

The study was undertaken to determine alternate fruits crops suitable for cultivation in paddy and non-paddy lands in Hambantota with the intention of enhancing farmer income and to cater to the emerging food diversity needs while upgrading the farmers' living standards. This study aims to develop suggestions for policy directives to popularize cultivation of alternative crops

MATERIALS AND METHOD

In Hambantota district the farmers were randomly selected in order to cover, 576 Grama Niladhari (GN) divisions under 12 Divisional Secretariats (DS). The relevant data were collected through primary and secondary sources. Climatological data (*i.e.*: maximum and minimum temperature, total rainfall, average relative humidity and average wind velocity) were collected from Agunakolapelessa and Wewerawila Agriculture Research Centers. Data related with the soil types of the DS divisions in the studied area were obtained from relevant secondary sources. Data related with the amount of available lands, non-cultivated lands *etc.*, were also collected from district Agrarian service Centers. Information on government subsidy programmes was collected from Department of Agriculture and Coconut Development Board. Primary data were collected through various means including a field survey

administering pre-tested questionnaire and direct interviews.

Field Survey

A field survey was performed during the month of August 2015 to October 2016 with randomly selected thirty six AIs out of seventy two (Represented 50% of the population). Necessary information was collected by means of a structured questionnaire. The information related to alternate fruit crops cultivated in both paddy and non-paddy lands in Hambantota district including their potentials, prospects, status of the farmers involvements, availability of extension services, farmers awareness on alternative crop cultivation, government supports, credit facilities, land availability, climatic suitability, water availability, water/ agrochemical/ fertilizer application frequency, method of cultivation and labour utilization *etc.*, data were collected through the questionnaire.

The constraints faced by the farmers were given a higher degree of attention where the crop-specific constraints and possible solutions were identified in order to propose solutions to get rid of them. Based on the findings of the first questionnaire, the second questionnaire was developed. One hundred and fifty ARPAs (representing 25% of GN divisions) were randomly selected for the second questionnaire.

The third questionnaire was developed on the basis of the findings of the first and the second questionnaires and information was collected through a purposive sampling technique. Twenty five farmers were selected randomly and proportionately for the third questionnaire.

Data Analysis

The collected data were tabulated and analyzed using descriptive (*i.e.*: bar chart and pie chart) and inferential statistical tools (*i.e.*: Chi-Square test) with minitab17 software.

RESULTS AND DISCUSSION

Climatological Data in Hambantota District

Though Hambantota district is located in dry zone of Sri Lanka, was the average annual rainfall is less than 1250 mm, slight climatic variations are reported in different Agro-Ecological Regions (AERs) such as DL_{1b}, DL₅ and IL_{1b}. Since the growth and development of crops thoroughly depend on the rainfall received by the area where an irrigation system has not been placed (Bareja, 2011), the amount of water received by means of rainfall is one of the key factors considered for crop selection (Peris, 2006). Therefore, the amount of rain fall is studied prior to the selection of a crop for cultivation purpose in the concerned area. The highest total rain fall (1,585.8 mm) was recorded in 2012 followed by a drastically decrement of amount of total rain fall (Figure 1).

A decreasing tendency of total rainfall in both DL1 and DL5 AERs was observed (Figure 1). Thus rainfall might have a negative impact on paddy production in those zones. Water availability in the tanks of the area has also been severely affected by the low rainfall. Therefore farmers tend to shift into alternative crops which require lesser water requirements. Unexpected high wind conditions are also found to be a limiting factor in some crop cultivations (*i.e.*: banana) in the studied areas. Therefore establishment of wind barriers in particular areas is learnt to be a good practice

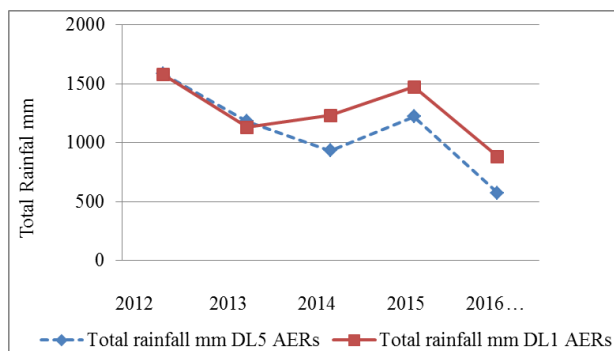


Figure 1: Annual rainfall (mm) of Agro-Ecological Regions DL1 and DL5 in Hambantota district from 2012 to 2016

to minimize the crop damages. According to AIs and ARPA Officers; banana, papaw, pomegranate, passion fruit, water melon, mango, cashew, pineapple and wood apple are the major fruit crops cultivated in the areas (Figure 2).

Number of farmers

As per the records of Perming (2013), the extent of banana cultivation in Sri Lanka exceeded 48,044 ha implying that country's fruit production is dominated by banana cultivation. Similarly, banana is recorded to have the highest extent with the share of 68% of total cultivated areas of fruit crops in Hambantota district, while all the other fruit crops are recorded to have less than 10% contribution. According to the farmers, the popularity of banana is basically due to its higher profit margin compared to the paddy cultivation. As far as farmers' point of view, there are hardly any issues associated than water availability for banana cultivation. Furthermore, as reported by Shubert (2004) also, available soil type (Reddish Brown Earth) in the area has a significant contribution to the progressive growth and yield performances of banana.

It is revealed that the success of the passion fruit cultivation in the area is due to the early support extended by the government through providing farmers with quality seeds and trainings. Poor government support on the other hand for the other fruit crops has discouraged farmers. Owing to the convenience,

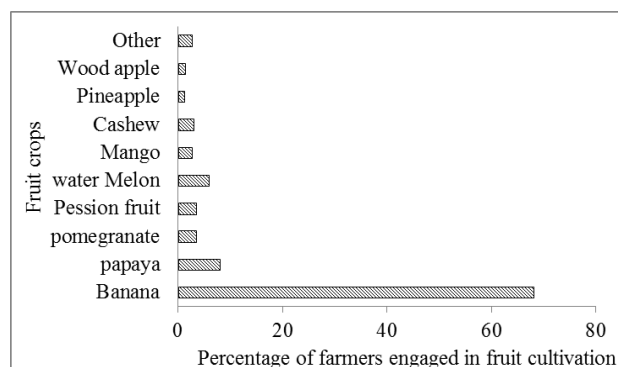


Figure 2: Percentage of farmers engaged in fruit crop cultivation in Hambantota district

lesser water and fertilizer requirements and resistance towards the pest and diseases, cultivation of passion fruit could be considered as an ideal alternative crop to be promoted in Hambantota district.

As learnt through the survey results, passion fruit has been widely grown in both Weeraketiya and Walasmulla DS divisions. Considering the similar climatic conditions available in Beliatta, Walasmulla and in some parts of Udayala and Tangalle, passion fruit could be promoted in those areas too. Furthermore, if a reliable source of irrigation is in place, the rest of the areas too could be considered for passion fruit cultivation.

Pomegranate, which secures higher demand and higher prices is not often cultivated by the farmers in the concerned areas. However, the crop could be found in the areas such as Hambantota, Lunugamwehera, Ambalantota, Agunukolapelessa, Suriyawewa and Thissamaharama DS divisions at relatively small scale. It is learnt that this can be expanded into a large extent if the constraints associated with cultivation were addressed. With the easiness of cultivation, lesser requirements of labour and pesticides, cultivation of pomegranate could be a profitable option as in the

cases of banana and papaya. With the availability of intermediate buyers who facilitate farmers with selling their products, pomegranate farmers could earn a favorable income consistently. Therefore, cultivation of pomegranate is found to be a fine solution for the water scarcity in the district. Farmers' engagement in fruit cultivation indifferent DS division is presented in Figure 3.

The fruit cultivation is dominated by Banana except Walasmulla and Weeraketiya DS divisions where passion fruit is found to be the major fruit crop. In Tangalle DS division, there is an appreciatory trend of cultivating water melon more or less similarly to the banana cultivation. Significant engagement in pomegranate cultivation is shown mainly in Hambantota, Lunugamwehera and Ambalantota DS divisions. According to the Export Development Board (2016), Sri Lankan fruit export is increasing steadily as we export both fresh and processed fruits. Therefore, farmers should be aware of emerging trends in export markets and the relevant standards upon which they could produce their products. Although there is a high potential to grow cashew in this area with the fullest support and encouragement of the government,

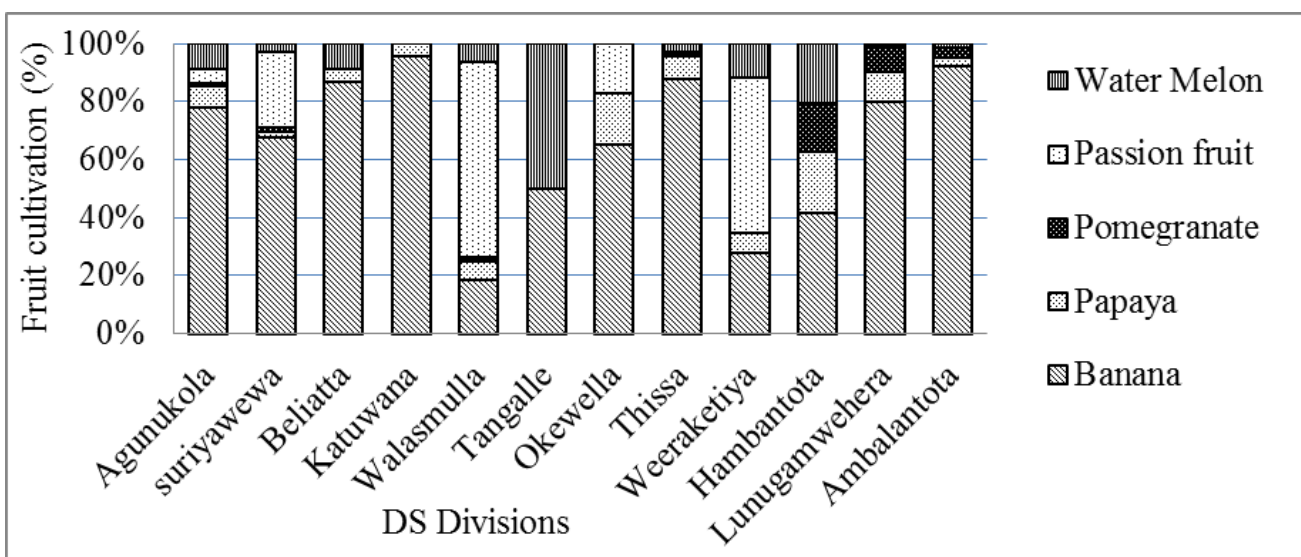


Figure 3: Fruit cultivation (%) in different DS divisions in Hambantota district in 2016 based on number of farmers

cultivation of cashew is yet to be popularized among the farmers of the area.

According to National food production programme (2016- 2018), per capita fruit consumption of Sri Lankan people in 2015 is 114g/ day which is significantly lower than that of the recommended level (200g/day). Therefore, government has taken actions to produce 2.2 million of planting material of fruit crops and has planned to establish 54 fruit villages in selected districts under the “Fruit Village Development Programme” enhancing the cultivation of fruit crops. It was noticed at the interviews, that farmers of the area appreciate such innovations and they are waiting for more encouragements. Other than such supports, awareness and promotion programmes to awake the farmers’ perception are highly important.

The vast majority of farmers (80%) have not obtained a proper education even up to the Ordinary Level. Despite the poor educational background, farmers are equipped with the farming knowledge gained through the life

Table 1: Percentage of Pesticide usage for different fruit crops

Crop	Pesticides Usage %			
	High	Moderate	Low	Not use
Banana	-	-	100	-
Water melon	60	40	-	-
Papaw	-	-	100	-
Pomagranate	-	-	100	-
Passion fruit	-	-	-	100

Table 2: Seed/planting material subsidy and selection of fruit crops

Seed subsidy	Selection of fruit crops (%)				
	Banana	Papaw	Passion fruit	Pomegranate	Water melon
Provided by govt. (through Department of Agriculture)	0	0	80	40	0

time experiences, which in fact has become the key factor of the success of their carrier. This traditional knowledge has been transferred from generation to generation orally. However, at present farmers are provided with novel knowledge and technologies through the service of AIs. Frequent farmer visits and providing farmers with the knowledge on novel cultivation techniques are amongst the major responsibilities of AIs. Majority of AIs (64%) conduct 6-10 training programmes per season. However, only 3% of the AIs are reported to conduct more than 11 workshops per season. Frequent visits to farmers are found to be a hard task for the AIs, thus majority of them (72%) visit around 125 farmers within a season. As a result, consistent update of farmers’ knowledge is hardly achieved.

Usage of Pesticide

A majority (52%) of farmers depends on the information provided by dealers on pesticide required for their cultivations, as compared their own experience and help from AIs (Figure 4). A considerable number of farmers (29%) use their own experience in making decisions on selection and use of pesticides as a result there is a possibility to over-use pesticides in the study area.

As revealed by the results, pesticides are not used in passion fruit orchards while they are used at lower ranges in banana, papaw, and pomegranate orchards. However, the success of water melon cultivations is reported to be highly depended on the usage of pesticides.

Seed Subsidy

As presented in table 2, seed subsidy pro-

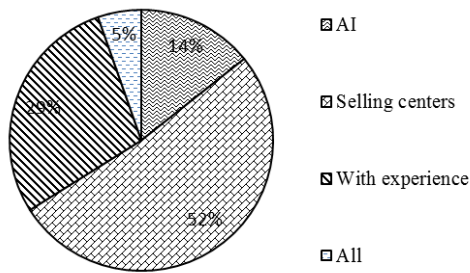


Figure 4: Sources of Information for selection and use of Pesticides

grammes (50% and 100%) have been introduced by the government for various crops.

A linear relationship was observed between seed subsidy and selection of crops. As shown in table 2, seed subsidy is believed to be one of the major reasons for the engagement of more farmers in passion fruit cultivation which on the other hand implies that cultivation of certain crops would be encouraged through the introduction of subsidy programmes. Farmers of the study area are of the view that the planting materials of fruit crops are more expensive than that of paddy. If the planting materials were available at an affordable cost, farmers might intend to shift to the cultivation of alternative crops.

In order to address the issues related to fruit cultivation, the government has launched a fruit crop development programme through which tissue-cultured banana plants and seedlings of papaw, mango, orange, pineapple, passion fruit, rambutan, pomegranate, citrus, guava have been distributed among the farmers by spending Rs 4,275,500 in 2016. Moreover since 2016, the government has allocated about Rs 652,500 for popularizing underutilized crops such as Katuanoda, Uguressa in Hambantota district.

With regard to the seed/planting material subsidy, majority of ARPAOs stated that farmers are satisfied with the quality of the improved fruit crop seeds. However, they are not satis-

fied with the both the quality and quantity of the local seeds provided.

None of ARPAOs was satisfied with the plastic tray subsidy. Occasionally, papaw and bananas are said to be transported using these trays once the middle agents visit the farms. Similar to the fertilizer subsidy given for paddy, farmers should be provided with subsidies for short duration crops cultivate in the same piece of land. It was further noticed at the interview sessions with Mahaweli farmers that subsidies are not properly distributed. Though fertilizer subsidy has not been recommended by the government for alternate crops, some exceptions are reported for the crops such as banana. Therefore, commencement of fertilizer subsidy for alternative crops would be a great motivation to uplift of the alternative crop cultivation.

Water Scarcity

Low land paddy is irrigated by the Department of Irrigation in collaboration with Department of Agriculture. The main water supplying bodies of the district have been classified as 'Maha wari', 'Sulu wari' and 'Mahaweli'. Lands without any irrigation facility are cultivated with both paddy and alternative crops as rain-fed crops. Government has implemented some policies through which water supply of 'Maha wari' and 'Sulu wari' has been restricted to paddy.

Yet, the restriction has been lifted to cultivate alternative crops of six month duration and one year for banana in the lands owned by Mahaweli Authority. About 40% of alternative crops are allowed to be cultivated in those lands. Majority (42%) of ARPAOs stated that the available water is not adequate for paddy. Yet, according to some farmers, the supplied water is not adequate for alternative crops grown in paddy lands also. At the same time, mid-season water supplying remains uncertain due to the lower level of water in tanks and some other unidentified reasons. Water availability for the crops that yields

within less than six months seems to be adequate. Perming (2013) reported that water shortage is a greater problem for the paddy farmers compared to banana farmers. Uplands are irrigated with water pumped from 'Maha wari', 'Sulu wari' channels. Yet, regarding some of the Mahaweli areas such as 'Ihaladikwewa', 'Medakotawaya' and areas under 'Chandrikawewa', farmers are not allowed to pump water from the local channels. Legal actions are also taken in this regards. Due to silt deposition, the capacity of the tanks has been reduced. As identified through the survey, 'Jasindeniya', and 'Walawwaththa' tanks in Katuwanashow poor performance in supplying water. Therefore there is an urgent need to engage in repairing of them.

In the areas such as Udayala, both the paddy and alternative crops are cultivated with 'Maha wari' and 'Sulu wari' water supply through 'Muruthawela' and 'Urubokuwewa' irrigation projects. Therefore cultivation is not hampered by water scarcity in the area. However, areas such as Weeragaswewa GN division, where single irrigation project Urubokuwewa is operated, farmers are suffered by water scarcity. Non-irrigated uplands in the areas such as Hambantota, Weekadawala, Tangle, Meegasara- kemegala are also severely affected by water scarcity.

Some of the farmers use drinking tap water for irrigation purposes. For an instant, farmers in Hambantota area are engaged in pomegranate cultivation very successfully even with the use of tap water. Though passion fruit has been introduced to Weeraketiya and Walasmulla areas, the cultivations are at risk during the dry spell. In order to address the water scarcity problem, water pumps, agro wells and micro irrigation schemes are also suggested. More than 50% of the micro irrigation subsidy schemes have been targeted to be launched in 2016 in Hambantota district. About ½ acre and ¼ acre sprinkler systems have been targeted to distribute among the

selected 23 farmers by allocating unit cost of Rs 35,000 for ½ acre. Water pumps of fuel type and electric type have been supplied to 9 (Rs 22,500/ Unit cost) and 13 farmers (Rs 16,000/Unit cost) respectively. Rain water harvesting tanks have been constructed in the areas such as Maththala, Thissa, Ambalantota, Meegahajadura. However, the capacity of such tanks is limited to a certain extent. Therefore, other methods of water supplying such as 'Ussana' water supply scheme need to be launched in these areas.

Chena cultivation in Hambantota district starts with 'Maha' rainfall in October each year. During the dry spell in August, farmers commence forest firing which is well known as 'Nikini Paaluwa'. A little rainfall received after September 15 is called 'Belithora Wessa'. The heaviest rainfall occurs in November with the monsoonal rainfall. Due to heavy rainfall, crops are damaged in areas such as Dambulla resulting in price increase in the month of December. Therefore most farmers in the district target in this time period are to release their products to the market.

During rainy period, over flowed water from 'Debarawewa' is collected to 'Thissawewa' and from there to the 'Yoda wewa'. In addition to it 'Aara' water is also collected to 'Yoda wewa'. When 'Yodawewa' over flows, flooding conditions are experience in downstream areas. 'Lunugamwehera wam iwra third irrigation project' is supposed to overcome these constrains. Moreover, another irrigation scheme should be commenced to supply water to 'Kawanthissapura'.

'Koggallakadawara tank' and 'Ridiyagama tank' store water throughout the year. Thus the nearby farmers are facilitated by those tanks. Furthermore upon the request made by the farmers, extra water from Mahaweli is supplied through 'Kudajullwewa' which is solve the water problem around Koggalla area.

Some of the anikets should also be repaired

with immediate effect. In this regards, ‘Thalwatta’, ‘Palladeniya’ anikets need much attention. A dam is needed to be made in ‘Murungasyaya’ and ‘Gagurandeniya’ in Katuwana. Medaketiya ‘Dolaaara’ in Beliatta needs to be repaired. Another identified issue through the survey is that the ‘Kekirio bata’, ‘Kiramaara’ projects are not operated successfully. Irrigation department does not maintain ‘Kirama aara’. ‘Pattiyawela’ dam is underutilized causing water problems in Dam-mulla west GN division. Water that is collected from some lands of Walasmulla area is called as ‘Odiya’ is used only for cultivation of paddy. Farmers in such areas are not engaged in cultivating other crops. Some of the farmers still meet their water requirements through ‘Bibula’ in the areas such as Beliat-takahawaththa GN division and Walasmul-lagalwadiya, Maapitakanda GN divisions *etc.*

Wild Animal Damages to fruit crops

Wild animal damage is one of the major concerns irrespectively the crop. The cultivations are severely affected by the damages of wild animals (Schubert, 2004; Sandika and Withana, 2010). Nearly 39% of the area has been damaged by wild elephants, monkeys, giant squirrels, buffaloes and peacocks (Figure 5).

It is learnt that the damages caused by monkeys and giant squirrels are very severe with regards to the alternative crops in Hambantota district. Beliatta and Tangalle areas were identified as the worst affected areas while their damages are critical in Idiketiya, Eldeniya and Ambagasdeniya areas as well. This has caused some farmers to abandon their cultivations. Therefore a sustainable solution is needed from the relevant authorities. Thissa, Suriyawewa, Lunugamwehera, Ambalantota and Hambantota are identified as severely affected divisions by elephants’ damage.

Damages caused by cows or buffaloes are also a matter of concern though they are not considered to be emerging issues. Koggalla, Lunugamwehera, Iththawekada, Parakkrama-pura, Yodakandiya and Wijithapura GN divisions are experiencing cow/ buffalo problem severely. At the same time, due to the appropriate measures that have been taken by the Divisional Secretary and some farmer organizations cow/ buffalo damages have not been reported in the other areas. Furthermore, a mechanism is in place through which such damages are compensated.

Elephant damages are hardly reported around the areas located near the electrical fences. In this context, physical barriers such as trenches

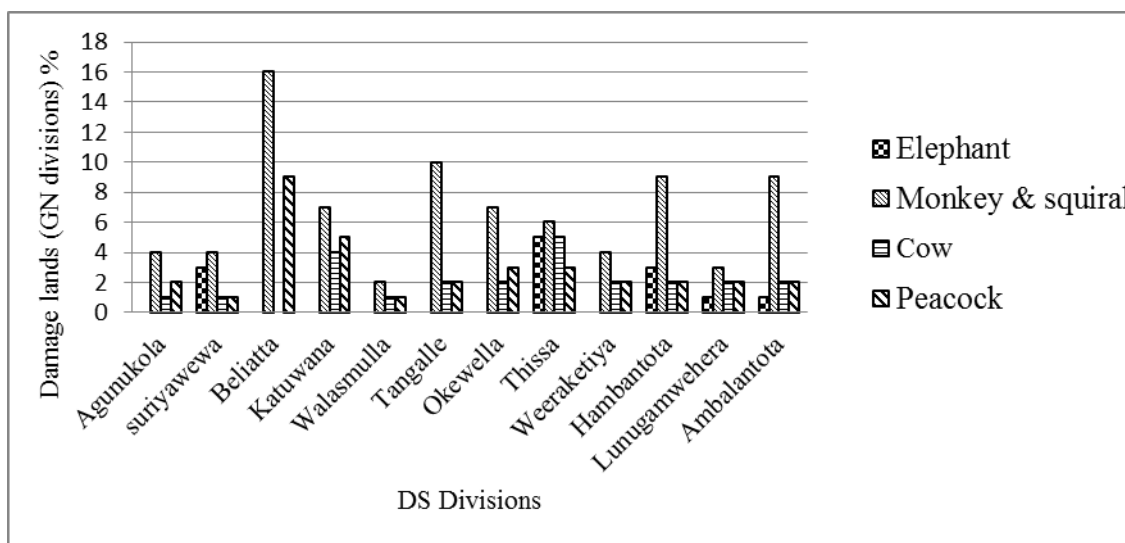


Figure 5: Estimated land area (%) damaged by wild animals in DS divisions of Hambantota

are suggested to be built. At the same time, shifting these animals to their natural habitats or to sanctuaries would be helpful to minimize the damages. Manual surveillance of the fields is time consuming, highly ineffective and expensive as the persons hired (Prasher *et al.*, 2015), thus electronic surveillance system is believed to be a good solution. Electronic surveillance system enables the farmers to protect their fields and orchards effectively without any human intervention.

Other issues

Proper storage facilities are a fundamental requirement with regards to a shelf life of a crop. However, present findings reveal that lack of storage facilities hamper the production of alternative crops in the district. If the farmers are provided with export opportunities, products should be handled with great care thus government intervention is needed.

Processing and value addition are to be considered as important steps which could ultimately increase the farmers income. Yet, a very little number of farmers (11%) have engaged in processing and value addition of produced fruits. However, it is learnt that the some intermediates earn higher profit margins than farmers due to their engagements in processing and value addition. Meantime the government has targeted to develop agricultural based industry by providing the farmers with grinders, dryers, sealers and balances etc., at a rate of 50% subsidy (Anon, 2016).

Cost Benefit Analysis

Table 3: Cost and Benefit of cultivated crops

Fruit Crop	Costs (Rs/ ha)	Income (Rs/ha)	Benefit (Rs/ ha)
Banana (Kolikuttu) (/ year)	903,500	3,500,000	+ 2,596,500
Papaw (/ year)	492,000	880,000	+ 388,000
Pomegranate(per year)	1,317,500	2,500,000	+ 1,182,500
Passion (/ year)	75,625	375,000	+ 299,375
Water melon (/ crop cycle)	155,500	262,500	+ 107,000
Paddy (/ crop cycle)	167,500	187,500	+ 20,000

Farmers' decision on selecting certain crops seemed to be linked with the profit gained (Table 3). In this context, Perming (2013) reported that the competition among the paddy farmers has caused dramatically letting down the price of paddy in certain seasons.

It is evident that farmers tend to cultivate certain fruit crops due to the higher profit margins. Furthermore food security through easy access to healthy and balance foods need to be considered. Banana is found to be the highest profitable crop cultivated in paddy lands irrespectively the initial high cost associated with banana establishment. However, by engaging banana cultivation, farmers have to wait at least one year to obtain the harvest. This in fact in certain areas has caused farmers to shift to short-term crops which have been encouraged by the government agencies as well. In terms of financial benefits, pomegranate is found to be the most suitable crop which generates an income one year after crop establishment, yet most of farmers reported to be unaware of the economical merits of pomegranate cultivation. The profit of the other crops changes with the period that the farmers cultivate them. These findings revealed that some farmers of the district are well aware of seasonal price changes and thus cropping calendars are made accordingly.

CONCLUSION

The survey conducted in Hambantota during 2015- 2016 revealed that farmers preferred to cultivate banana in in paddy lands for economical gains. A strong relationship was ob-

served between the seed subsidy and the selection of passion fruit as an alternate crop implying that a sound scheme of subsidies could effectively be used in popularizing alternate crops among the farmers. The main reasons for unrevealing of the potential of those alternate crops and unpopularity are unawareness among farmers, unavailability of lands, issues related with irrigation, damages by the animals and most prominently lack of government support which include subsidies for fertilizer, seed, plastic trays and credit facilities *etc.* Addressing these issues could enhance the production of fruits as alternative crops in Hambantota district ensuring considerable economic gains to the region.

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