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Application of indigenous knowledge in rural agriculture: A study on existing indigenous practices among women farmers in Monaragala district, Sri Lanka

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Abstract
Women play an important role in agrarian societies and they are of vital importance to rural economies. Application of indigenous knowledge in rural agriculture is a unique aspect in majority of the developing countries including Sri Lanka. Women farmers in rural societies mainly depend on this knowledge and there is a strong relationship among them, rural agriculture and the application of indigenous knowledge. Even though this age-old knowledge provides many practical solutions to the issues aroused in contemporary agricultural sector, the practicability and the popularity of them are being rapidly declined. Due to different reasons majority of them have now been started to extinct. Therefore, there is a pressing need to carry out detail studies with special focus on the applications of indigenous knowledge in agricultural activities undertaken by women in rural societies. This study attempts to investigate the existing applications of indigenous knowledge in different agricultural activities undertaken by women farmers in two agricultural villages in Monaragala District, Sri Lanka. The methodology applied here involved a multistage process. Two research sites were selected through a systematic judgment sampling technique and stratified sampling method was employed to select 58 women farmers for the questionnaire survey along with 16 key informants. Data collection was carried out over a period of two cultivation seasons applying both qualitative and quantitative techniques. Mainly, a manual thematic analysis was applied as a qualitative analytical tool while simple statistical methods were employed to analyze quantitative data. The findings of the study reveal that the women farmers applied a vast variety of practices derived from indigenous knowledge in different stages of a cultivation season and they are very knowledgeable about the perceived benefits. The practicability and the popularity of this knowledge have been rapidly declined due to different reasons and farmers do face many constraints consequently. Despite such constraints and limitations, the application of this knowledge in agriculture generate multifaceted advantages. Therefore, novel approaches, policies, practices and initiations are timely and significant to revitalize, re-emergence and perpetuation of the indigenous knowledge systems that has been preserved over centuries.

Keywords: indigenous knowledge, rural agriculture, women farmers

Introduction

The relationship between women and agriculture has been a central theme in rural settlements since the dawn of the human civilization. Similarly, the link between rural agriculture and application of indigenous knowledge in farming activities is a unique aspect in majority of the developing countries. These systems constitute major impetus to pursue age-old traditions and practices. However, the contemporary indigenous knowledge systems all over the world are increasingly endangered by large-scale commercialization of agriculture, mechanized agricultural systems of global monoculture, changing population dynamics, land-use changes and the impacts of the globalization. Yet, different applications of indigenous knowledge systems in relation to agricultural practices have still been remained and are being in practiced among many rural societies including Sri Lanka.

The use of indigenous knowledge systems in agriculture is a focal theme in many research conducted in different countries. Over decades, a number of authors have made their attempts to explore different aspects related to this theme. Among them the methods, practices and applications of indigenous knowledge in agriculture, the importance of preserving and adapting indigenous knowledge in farming practices, issues and constraints faced when this knowledge is used and other related aspects are noteworthy. According Mishra et al. (2020) [9], indigenous knowledge systems in agriculture, animal husbandry, fisheries and other land-based activities have been used for ages by farmers and animal owners. Aluko (2018) [3] cited the research carried out by Nnadi et al. (2013) and stated that indigenous knowledge system is an important asset with regard to the social capital of local people, particularly insofar as it often constitutes the main resource for their livelihoods. This argument clearly emphasizes the importance of indigenous knowledge systems in agriculture which is one of the main elements of rural livelihood systems that is the root of the rural economy.

Women play an important role in agrarian societies in different ways and they are of vital importance to rural economies. They have been central to the production, processing and marketing of food and also use indigenous knowledge to improve their livelihoods (Ugboma, 2014) [12]. A series of research related to women, indigenous

knowledge and agricultural practices have been conducted in many of the African countries. Seleti and Tlhompho (2014) [11] emphasized and highlighted a number of important themes related to this aspect through their research conducted on African rural women farmers and their indigenous agricultural knowledge. Above authors have further cited the works of Hyzer (2008) and stated that there is a direct link between rural women farmers and the application of indigenous knowledge systems in different aspects of rural agriculture. Accordingly, it is clearly evident that a large majority of women farmers depend on indigenous knowledge systems in household livelihoods including rural agriculture. Seleti and Tlhompho (2014) [11] further claimed the citations of Johnson (2007) and justified this background in detail. Anyoha et al. (2021) [4] supported the opinion of Ugboma (2014) [12] to express that rural women use their indigenous knowledge to raise agricultural productivity. As they further explained women also use indigenous knowledge to improve the livelihoods to develop survival strategies.

Another significant aspect related to the application of indigenous knowledge by women have been highlighted by Olatokun and Ayanbode (2008) [10]. According to them, rural women in the African countries have for millennia been central to the breeding of food crop species, preservation of seeds and the domestication and use of wild edible plants. As they have further described, these women were able to complete above practices through the application of their indigenous knowledge. This aspect also a clear elucidation about the central theme of this research.

Akhter et al. (2010) [2] have highlighted a multifaceted aspect related to the main theme concerned in this study. According to them, women are heavily involved in all most all the aspects of homestead productions from selection of land to decisions regarding which crops are to be grown and to be harvested. In the same research, Akhter et al. (2010) [2] have further identified different activities performed by women and those include a number of activities from land preparation to harvesting, storing and post harvesting. This background has been highlighted by these authors through few examples. In the process of fertilizer applications, women believe that the remaining ash from different kinds of fuel wood and cow dungs are sufficient for the growth of new crops. At the same time, they also have a responsibility for pest control and use a simple indigenous remedy that is the application of ash on plants infected by pests. Also in harvesting process most of the activities are carried out by women. Similar aspect regarding the women's role in agricultural activities have been elaborated by Grantham (1996) [7]. In her literature review, she has highlighted Acharya and Bennett (1983); UNICEF (1987) and Timsina et al. (1989) to elaborate different aspects of women centered agricultural activities. Accordingly, women undertake a series of activities including the collection of fodder and feeding livestock, kitchen-gardening, collection of organic fertilizer and manure for fertilizing the crops. They also involved in farm maintenance, seed-bed preparation, sowing, planting, weeding, seed selection, threshing, harvesting, food transportation and water supply.

According to above discussion, it is clearly evident that there is a strong relationship among women, rural agriculture and applications of indigenous knowledge. Accordingly, it has been a central theme in many research conducted in different countries. The overall gamut of the literature considered here highlights different aspects about the central theme of this study. Majority of them have been emphasized the experiences of the women of the African and Asian societies. Despite of this rich and diverse research background, there is a dearth of published research which highlight the Sri Lankan context and experience on women who employ indigenous knowledge in rural agricultural practices. Therefore, there is a timely need to carry out an in-depth study which critically analyze the existing applications of Sri Lankan indigenous knowledge systems in rural agricultural activities employed by women farmers.

Being one of the oldest tank based civilizations of the world, Sri Lanka holds a long agricultural history and tradition with rich and diverse applications of indigenous knowledge systems. The age old agricultural system of the country can mainly be divided into a few categories i.e. paddy cultivation both rain fed and irrigated, shifting or slash and burn cultivation that is mainly take place in highlands or forest lands and subsistence agriculture in which farmers grow food crops to meet the needs of themselves. One of the common features of all these agricultural systems is the employment of an immense amount of methods, technologies and practices developed over centuries. Such valuable ancestral knowledge is being in used even in the present context of the above three fold agricultural systems of the country. Similar to the other developing countries in Asia, Africa and Latin America, a large majority of Sri Lankan women have also been engaged in agricultural activities. As reported by the Department of Census and Statistics (2020), of the total women employed in the country, 27.7% (this share is 25.9% for males) are working in the agricultural sector and majority of these women engaged in subsistence agriculture. It is also noteworthy to mention here that the women in agricultural sector in Sri Lanka are nearly 40% of the total agricultural workforce of the country. Accordingly, the high level female labor participation is a distinctive feature of the Sri Lankan agriculture.

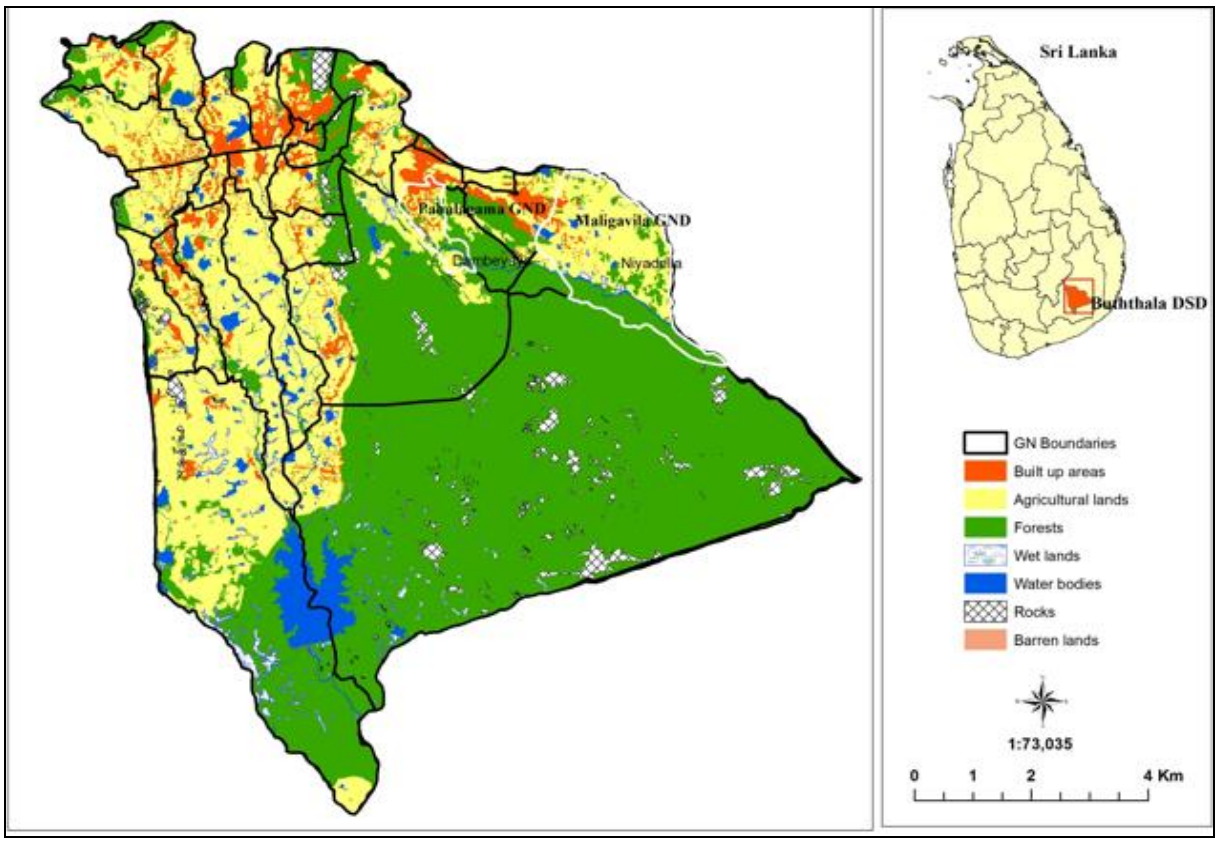
Gender specific role is a unique and fascinating aspect which can commonly be seen in all the phases of the Sri Lankan agricultural systems. The report titled "Country Gender Assessment of Agriculture and the Rural Sector in Sri Lanka" published by the Food and Agriculture Organization of the United Nations (2018) categorizes gender roles in the stages of crop production, harvesting and sale of produces. As the report evinced, women play a diverse role in the agricultural sector of the country. Application of a wide range of indigenous practices is a noticeable aspect in this agricultural sector, especially being applied by women farmers.

Objectives

The main objective of this research was to study the existing applications of indigenous knowledge in agricultural activities of women farmers in *Dambeyaya* and *Niyandella* villages in *Buththala* Divisional Secretariat Division of *Monaragala* District, Sri Lanka. Other specific objectives were to examine different agricultural activities performed by women farmers; to investigate the indigenous practices applied by them; to study perceived benefits of using the indigenous knowledge in the identified agricultural activities and to examine different challenges faced by them in the use of indigenous knowledge in their farming practices.

Materials and Methods

The methodology applied in this research involved a multistage process. The study area was selected in consultation with agricultural research and production assistants of respective Grama Niladhari Divisions (village level sub-administrative unit) of *Buththala* Divisional Secretariat Division. With perusal of their opinions, villages with highest number of women farmers were listed down to select the research sites. At the same time, attention was given to identify the number of women who engaged at least one practice out of paddy cultivation, chena cultivation and home gardening. In this process, it was also considered to select women who possess experience in employing indigenous knowledge related practices in their cultivations. With perusal of all these factors, two villages namely *Dambeyaya* of *Pahalagama* GND and *Niyadaella* of *Maligavila* GND were selected as research sites applying the judgment sampling technique (Figure 01).



Source: Developed from various sources

Fig 1: The study area

Sample selection was the next step of the methodology of this study. With the aim of providing an equal chance to be a part of the sample, a multistage sampling technique was employed to select the women farmers. All the identified women were categorized into a few strata considering a number of criteria such as age, nature of cultivation, extend of the cultivated land and the nature of the applications of indigenous knowledge in agricultural activities. Accordingly, the stratified sampling technique was applied to select the respondents (58) for the questionnaire survey. Another 16 experienced, old aged women farmers who had previously been engaged in agricultural activities were selected as key informants for focus group discussions, semi-structured interviews, case studies and event records.

Data collection process of this study was carried out over a period of two cultivation seasons; *Yala* (the cultivation season starts by May and ends by August) and *Maha* (starts by September and ends by March) to cover the whole process of the aforesaid agricultural practices. A mixture of tools belongs to both qualitative and quantitative research techniques were applied to collect data. In this regard, a questionnaire survey (58) along with semi-structured interviews (05), focus group discussions (05), case studies (02), event records (04) and a series of observations were employed. The qualitative data collected from the field survey was analyzed by using

the method of manual thematic analysis and descriptive statistical methods such as central tendencies and frequencies were employed to analyze the quantitative data.

Results and Discussions

This section focuses on providing a descriptive analysis on few sub sections. It includes an overview of the socio-economic and demographic profile, a detail analysis on women centered agricultural activities; existing indigenous practices employed in; perceived benefits in application of the indigenous knowledge and different challenges faced by women famers in the study area.

Socio-economic and demographic profile of the women farmers

Socio-economic and demographic profile of the women farmers of the study area depicts a varied picture and it includes few important characteristics such as age, level of the education and the level of the income (Table 01).

As shown in Table 01, the number of respondents (58) represent a vivid background according to their age, level of the education and the level of the income. When the age structure of the respondents is considered, a direct relationship between the same and the application of indigenous knowledge could be noticed. More than a half of the respondents (37 women or 63.8%) belongs to the age range of 50 years and above. The number of women farmers who are in the age range between years 30-39 and 40-49 are 08 (13.8%) and 13 (22.4%) respectively. Accordingly, it was clearly evident that the use of indigenous knowledge in agricultural activities is increases so does the age.

The level of education is another criterion considered to review the demographic profile of the respondents. The results of the questionnaire survey reveal that 05 (08.6%) women farmers can neither read nor write. Numbers of respondents who have studied up to grade 05 is 11 (19.0%). The results further revealed that 14 (24.1) farmers have studied up to the ordinary level while 08 (13.8) have studied up to the advanced level.

Table 1: Socio-economic and demographic profile of the women farmers

Characteristic	Frequency	Percentage
Age Level		
30-39	08	13.8
40-49	13	22.4
50-59	16	27.6
60 <	21	36.2
Level of the Education		
Illiterate	05	08.6
Up to grade 05	11	19.0
Grade 06-10	20	34.5
Up to ordinary level	14	24.1
Up to advanced level	08	13.8
Level of the Income* (per cultivation season)		
Less than 5000	04	06.9
5,000 – 10,000	08	13.8
10,000 – 20,000	13	22.4
20,000 – 30,000	17	29.3
30,000 <	16	27.6

* Sri Lankan Rupees Source: Field Survey, 2020-2021.

Income per cultivation season of the respondents vary according to different criteria such as the extent of land and crop varieties cultivated, nature of the cultivation, labor cost (if used paid labor) and the market price of the produced.

Accordingly, 17 women farmers (29.3%) received between rupees 20,000-30,000 per cultivation season while 16 (27.6) earn more than rupees 30,000. The respondents who received this higher income range are engaged in full time farming since their main occupation is agriculture. As Table 01 further depicts, there are 13 (22.4%) women farmers who earn between rupees 10,000-20,000 while 08 (13.8%) earn between rupees 5,000-10,000. Number of respondents who received a total seasonal income less than rupees 5,000 is 04 (06.9%).

There are number of reasons impact on this low income viz. the use of agricultural inputs such as fertilizers, part time engagement in agricultural activities and consumer oriented farming.

Nature of the cultivation

Nature of the cultivation in which the women farmers of the study area are engaged can be discussed under several sub sections such as the basis of the engagement either as full time or as part time, combination of the farming activities, land allocation for cultivation and the crops cultivated (Table 02).

Table 2: Nature of the cultivation of women farmers

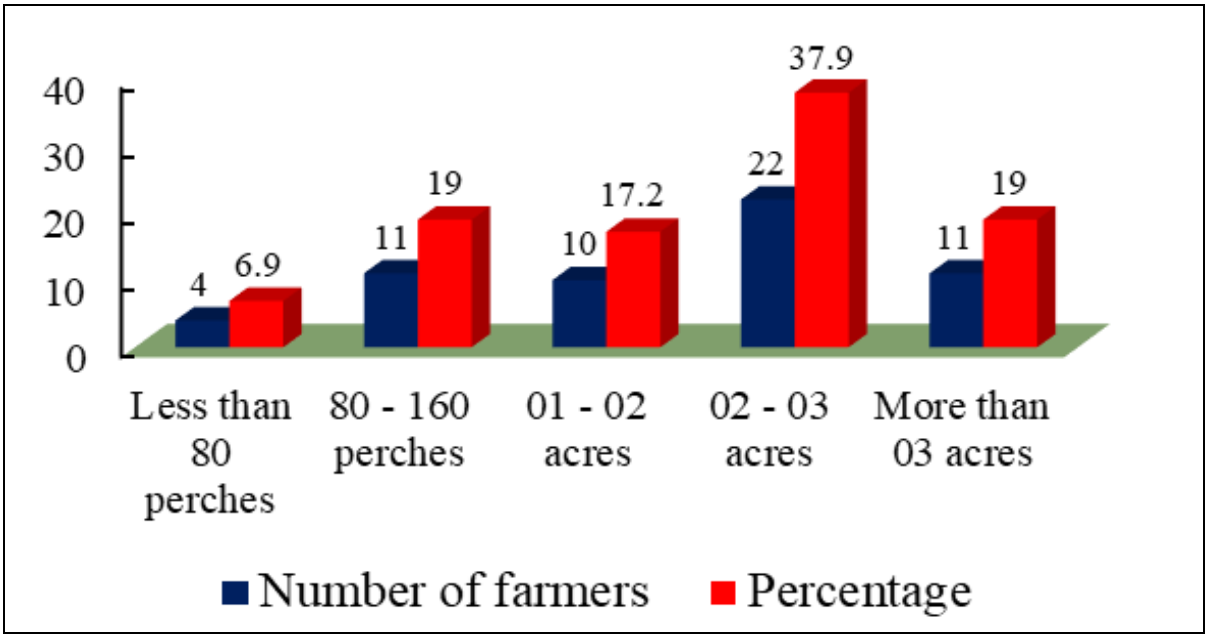
Characteristic	Frequency	Percentage
Basis of the engagement in farming		
Full time farming	36	62.1
Part time farming	22	37.9
Combination of the farming activities		
Paddy cultivation only	08	13.8
Chena cultivation only	10	17.2
Home gardening only	04	06.9
Paddy and chena cultivation	10	17.2
Paddy and home gardening	08	13.8
Chena and home gardening	03	05.2
Paddy, chena and home gardening	15	25.9

Source: Field Survey, 2020-2021.

As reported in Table 02, women farmers of the study area are engaged in agricultural activities either as full time or as part time basis. Accordingly, 36 (62.1%) of the total famers surveyed are engaged in full time farming while it is a part time occupation for 22 (37.9%). Some of the farmers belonged to the second group involved in other occupations such as running a small boutique, buying and selling of agricultural produces, labor supplying and engaged in self-employments.

Table 02 further shows the diversity of farming activities which can broadly be divided into 07 categories. With perusal of the data related to this aspect, several important conclusions can be drawn. Accordingly, chena cultivation is the most popular category flowed by paddy farming. The number of farmers who engaged in these agricultural activities are 10 (17.2%) and 08 (13.8%) respectively. There are only 04 (06.9%) women who engaged only in home gardening. The field survey further reveals another unique aspect about the women farmers who have simultaneously engaged in two or three types of faming activities. Most of them (10 or 17.2%) are involved in paddy and chena cultivation. Total number of farmers who engaged in paddy and home gardening is 08 (13.8%) and chena and home gardening is 03 (05.2%). Moreover, it could also be noticed that 15 (25.9%) farmers carried out all three farming activities simultaneously. And also there are 41 farmers who are engaged in paddy cultivation by any mean. Similarly, there are 38 farmers who cultivate chena with other crops or alone and 30 farmers engaged in home gardening in the same manner.

Land allocation for agricultural activities is another important aspect revealed through the field survey. As depicts in Figure 02, the smallest extent of land which is less than 80 perches have been cultivated by 04 (06.9%) farmers and they have mainly been engaged in home gardening. Figure 02 also reveals that 19.0% or 11 farmers of the respondents have cultivate a plot of land which ranges between 80-160 perches. Further, 10 (19.0%) women farmers cultivate between 01-02 acres, 22 (37.9%) farmers cultivate between 02-03 acres and 11 (19.0%) farmers cultivate more than 03 acres. In a cross sectional analysis between the land allocation and farming activities, a direct relationship could be noticed. That is, the farmers who cultivate a large plot of land do engage in multiple farming activities and vice versa (Figure 02).



Source: Field Survey, 2020-2021.

Fig 2: Land allocation for agricultural activities carried out by women farmers

Varieties of the crops cultivate is another fascinating aspect of the agricultural activities which are being carried out by the women farmers of the study area. These included traditional dry zone vegetables, grains, yams, legumes and other miscellaneous crop varieties (Table 03).

Table 3: Varieties of crops cultivated by the women farmers

Crop Cultivated	Number of Farmers (out of 58)	Crop Cultivated	Number of Farmers (out of 58)
Rice	41	Banana	34
Cowpea	29	Maize	28
Cassava	28	Ground nut	26
Brinjal	23	Long bean	21
Finger millet	17	Spine gourd	17
Green gram	17	Bitter gourd	16
Sesame	12	Pumpkin	12
Cucumber	12	Okra	11
Luffa	09	Water melon	07
Green chili	05	Black lentil	05
Tomato	04	Foxtail millet	03
Millet	01	*Kudira*	01

Source: Field Survey, 2020-2021.

The popularity of the crops cultivate by the women in the study area is depend on few criteria such as the land extend allocated for the cultivations, yield, the level of the income, availability of seeds and planting material, personal interest and other requirements needed. Accordingly, the crop varieties included in Table 03 can be categorized into three main categories as the most popular varieties, moderately popular varieties and least popular varieties. The first category included rice, banana, cowpea, maize, cassava, ground nut, brinjal and long bean. It is noteworthy to mention that more than 20 of the total women farmers surveyed are engaged in these cultivations. Finger millet, spine gourd, green gram, bitter gourd, sesame, pumpkin, cucumber, okra, luffa and water melon are the crops identified as the moderately popular varieties. Between 07-19 women farmers are engaged in these cultivations. The number of farmers who cultivate the least popular crop varieties including green chili, black lentil, tomato, foxtail millet, millet and *Kudira* (type of Sorghum bicolor) are less than 05. With perusal of the group discussions, interviews and case studies conducted, a several important aspects related to the crop varieties cultivated could be identified. Among them following are noteworthy. Even though the popularity of the crops cultivated are being fluctuated, cultivation of new hybrid varieties which generate more harvest has now become a new trend in the agricultural activities of these rural villages. Consequently, some traditional verities have now been started to extinct. Foxtail millet, black lentil and millet are some examples for such varieties. This situation was revealed by an interviewee as follows:

"Crops that were cultivated two or three generations ago are now a little harder to find. The reason for this is the introduction of new hybrid seed varieties which are more popular today. Old seeds have now been hybridized. When these new varieties are grown, the yield is higher. But, growing those is a bit difficult task since they just need more inputs such as fertilizers, weedicides and pesticides. Yet farmers prefer to cultivate new hybrid varieties since the benefits of cultivating them are many. But it will lead to the extinction of traditional crops" (Key informant, number – 01).

Women's involvement and application of indigenous knowledge in agricultural activities

Studies related to women specific farming activities in indigenous agricultural societies have been carried out by different researchers. Most of such studies highlighted the experiences of the African countries. In subsistence agriculture of South Africa where the agriculture is mostly based on local knowledge, women are involved in almost all aspects of farming which include seed selection, planting, harvesting, weeding, winnowing and grain storage (Seleti and Tlhompho, 2014) [11]. Olatokun and Ayanbode (2008) [10] highlighted some women specific agricultural activities in South Sudan. Accordingly, they have cited the research findings of Easton and Ronald (2000) and stated that women in southern Sudan are directly responsible for selection of sorghum seeds saved for planting each year. They have further highlighted the role of North Indian elderly woman farmers in seed selection and storage. Grantham (1996) [7] summarizes the research findings of Loufti (1987) to elaborate women's tasks and knowledge in agriculture. Accordingly, rural women typically perform much larger range of agricultural activities than men and they may hold different domains of knowledge relative to their roles in agriculture. Seleti and Tlhompho (2014) [11] discuss few important aspects about women's role in agricultural activities and application of indigenous knowledge. The authors hold the opinion that the majority of women subsistence farmers depend on indigenous knowledge for ensuring a sustainable household livelihood. According to them, there is a limited number of tasks that are done exclusively by men such as clearing of fields. In contrast, women perform a large majority of tasks on their plots, from sowing and weeding to harvesting and storing. At the same time, they assist men in clearing and preparing the land for cultivation. As per the information gleaned from the field survey, such similar background could be identified in the study area too. When the overall farming activities carried out by the women of the study area are analyzed, it was clearly

evident that they are engaged in a number of important activities from the beginning of a cultivation season up to its end. Similarly, there is also a wealth of local knowledge that they use in conjunction with all these activities. During the field survey, it was possible to identify a series of indigenous activities which are being employed by women farmers in the whole process of farming. In a detailed analysis, the activities could be categorized according to a sequential order of the different stages of farming practices (Table 04).

Table 4: Women specific agricultural activities, application of indigenous knowledge and perceived benefits

Agricultural activity	Application of indigenous knowledge	Perceived benefit/s	Number of farmers practiced
Land clearing and ground preparation	Clarence of shrubs and other plants before the commencement of the cultivation season and allow them to decompose or burn after drying. If set on fire, the ashes are allowed to collect on the ground and ultimately added into the filed.	Better loosening of the soil, destruction of weed seeds by burning, increase the soil fertility, increase the amount of humus added into the top soil and softening of the soil texture by termites and other insects, increase the interactions of soil organisms.	38
Seed selection	Protect the most fertile plants of the cultivation to obtain seeds for the next season. Keep the seeds mixed with sand, Margosa (*Azadirachta indica*) leaves or wood ash.	High germination rate along with a high yield. Protecting the seeds from weevils, beetles and other small insects. Seed security.	29
Sowing, nursery management and transplanting	Soaking the seeds before planting or sowing. Seeds with a hard bark are buried in the wet ground for better germination and planted in the field. Mixing with sand during sowing. Spray wood ash around the nursery. Removal of tender shoots at replanting.	High germination rate. Facilitate germination. Systematic and uniform seed dispersal. Protection of small plants from small animals such as snails and warms. Controlling transpiration rate and better and faster sprouting.	44
Weed controlling	Hand weeding (manual removing). Using manual weeding practices such as hoeing,	Enhance soil fertility due to decompose. Can be taken home to feed animals. Can be used to produce compost. Provides clean and thorough weeding.	58
Pest controlling	Use of plant substances obtained from seeds, plants, roots, stems, barks, flowers and leaves. Repelling insects by using different pest controlling methods such as keeping lighted oil lamp in the field, trapping and adopting different types of biological or mechanical pest controlling methods. Other manual systems such as shouting and fixing of scarecrows. Manual fencing.	Environmental protection with minimum use of pesticides. Self-perpetuating or self-sustaining benefits. No addition of toxic material into soil, air, water and the environment. Protection of the cultivation.	04
Fertilizer application and plant protection	Use of manure from goats, chicken and cattle, fuel ash, ash of paddy husks, composts produced by domestic wastages, crop residues.	Retention of long term soil fertility, impact on soil texture and stabilization, improve moisture retention and environmental protection.	19
Harvesting and threshing	Use of traditional instruments such as sickle. Use of mammoties for potato harvesting. Keeping straw in the field after threshing. Manual reaping and threshing.	Can be used traditional labor sharing methods such as *Attama*. Minimum damage to the harvest. Minimum wastage. Enhance soil fertility.	13
Storage and post harvesting	Winnowing and sun-drying. Storage in *Atuwa* or *Bissa*. Packaging in sacks made out of hessian or bags made of out of reeds. Mixing with sand or ash and keeping in large vessels. Hanging Margosa branchlets among sacks and inside of Atuwa/Bissa in which the harvest has stored.	Protection of the harvest up to the next season. Food security. Pest and insect control.	47

Source: Field Survey, 2020-2021.

As indicated in Table 04, a series of indigenous practices are being used by rural women farmers in different stages of their agricultural activities. The number of farmers who use such traditional practices vary from one stage to another. Accordingly, all most all farmers (58) use traditional manual weeding practices such as hand weeding and hoeing. Storage and post harvesting (47), sowing, nursery management and transplanting (44), land clearing and ground preparation (38) and seed selection (29) are the other stages in which the traditional practices are mostly being applied. Indigenous knowledge base is being used in fertilizer application and plant protection and harvesting and threshing related activities by 19 and 13 farmers respectively. It was also revealed in the field survey that the traditional bio-pesticide techniques are now becoming extinct. Accordingly, the number of farmers who use such pest controlling methods is only 04. Some of such important aspects applied in agricultural activities of the study area are shown in Figure 03.

A. Lighting a traditional flambeau in the paddy field to repel insects such as Asian rice gall midges and Brown planthoppers
B. Dragging a coir rope soaked in a solution mixed with the latex of Daluk leaves (Triangular spurge), resin, coconut oil and turmeric powder to repel Rice yellow stem borers and other insects.
C. Fixing coconut leaf base in the paddy field to attract owls and other birds. This help to control rats and warms in the field.
D. Adding chopped *Daluk* (*Triangular spurge*) leaves with latex to control Stemborers and Whorl maggots.
E. Hanging Margosa (*Azadirachta indica*) branchlets along filed bunds to repel insects.
F. Hanging *Daluk* branches along filed bunds. This helps to add toxic latex into the paddy field and result in repelling warms.
G. Fixing coconut husks on stalks in the paddy field to attract owls and other birds. This help to control rats and warms in the field.

Source: Field Survey, 2020-2021

Fig 3: Existing applications of indigenous knowledge in pest controlling

According to above discussion, it is very well discernible that the women farmers of the study area employ a wide range of indigenous practices in their agricultural activities. But, a number of factors which have been impact on the extinction of such activities could also be identified. Apart from the questionnaire survey, a number of group discussions and case studies were conducted to investigate the reasons impact on the extinction of different applications related to indigenous knowledge. This background can be elaborated through few statements made by elderly women farmers as follows:

"Many of the traditional practices that existed in the past are no longer be available. It is due to the fact that of the arrival of modern agricultural equipment and hybrid seed varieties. Everyone wants to get things done quickly and easily and all of them expect a good harvest. So the farmers are tempted to do the manual work with these modern equipment quickly and easily. These factors are the main reasons for the demise of our old agricultural systems. ……" (Key informant, number – 02).

"Today there are only a handful of old things which were in used in the past. Land preparation is still done in the old way by a limited number of farmers. Many of the farmers use tractors and land masters (a two wheel

tractor) for their land preparations and other related activities. Even imported seeds can be bought from shops. Even though, the price of them is relatively high, farmers wish to use such developed hybrid verities since those produce a high yield. When these new seeds are cultivated, it is required a large amount of inputs such as fertilizers which need to be brought form the foreign countries. As a result, the use of traditional fertilizers such as agricultural residues, straw, coconut husks, cow dungs and compost have become obsolete……" (Key informant, number – 04).

The perceptions gathered through the interviews were systematically summarized based on a number of codes and categories and converted into a manual thematic analysis. Accordingly, it was revealed that a number of reasons have been caused on the extinction of the indigenous practices used in agricultural activities (Table 05).

Table 5: Thematizing the causes impact on the extinction of the indigenous practices used in agricultural activities

Theme	Category	Codes
Technological advancements	Introduction of new machineries such as tractors	Deterioration of knowledge in land preparation
	Introduction of harvesting machines	Extinction of indigenous practices applied in harvesting and storing
		Extinction of traditional methods applied in seed selection and protection
Introduction of chemical/mechanical agricultural inputs	Introduction of new chemical fertilizers	Declining in the use of traditional manures
	Introduction of weedicides, pesticides and insecticides	Reduction of the use of plant substances in pest controlling
		Disappearance of traditional pest controlling methods
		Extinction of biological or mechanical pest controlling methods
		Non-existence of manual systems such as shouting and fixing of scarecrows
Changes in land use patterns	Land fragmentation and shrinking of home gardens	Reduction of traditional seed varieties due to the expectation of high yield from a small plot of land
		Reduction of traditional cultivation systems (such as *Bethma*, *Thattu Maru*, *Katti Maru* systems)
		Application of intensive methods to maximize the harvest which cause on the reduction of traditional time taking methods
		Disappearance of traditional famer organizations performed a significant role in maintaining indigenous practices
Changes in agricultural systems	Declining of subsistence agriculture	Popularity of market oriented farming practices resulting the dis-popularity of traditional crops cultivated in home gardens
		The ready availability of many commercial foods resulting in reduction of subsistence farming
Attitudinal changes	Generational attitude gap	Depicting indigenous knowledge as inferior, primitive, simple, static or folklore
		The prevailing attitude as the use of new agricultural inputs are easy and simple
	Commercial propaganda	Advertising by commercial companies as indigenous cultures and methodologies are backward, inferior or out of date

Source: Developed by author, 2022.

As depicted in Table 05, the factors impact on the extinction of the indigenous practices used in agricultural activities could be identified under 05 main themes such as the technological advancements, introduction of chemical/mechanical agricultural inputs, changes in land use patterns, changes in agricultural systems and attitudinal changes. Each category comes under few main themes which represents a series of codes. These themes clearly explain different ways and means impact on the deterioration of indigenous knowledge used in rural agriculture. Some of the above themes have been studied in detail by several researchers. As described by Kazmi et al. (2014) recent agricultural practices around the world show that mechanized farming and use of latest technological advancements in agriculture sector will not be as appropriate method as indigenous practices. Citing the research findings of Ahmed (1994) they have further elaborated that the existence of agricultural indigenous knowledge is threatened by the rapid development process and that indigenous knowledge systems are 'at risk of becoming extinct'.

Challenges faced by women farmers in the use of indigenous knowledge in agricultural practices

By the nature, the traditional rural agriculture is mainly characterized by a mix and multiple cropping methods which are very unique in chena and home gardens. These traditional features are changing rapidly due to different reasons and many authors have highlighted this aspect in their research. As stated by Abeywardena et al. (2019) the indigenous agricultural systems of the dry zone of Sri Lanka are highly vulnerable to the rapid

population growth, economic and market changes, educational development, modernization and development pressure. Due to the influences of aforesaid reasons, the agricultural activities of the study area are also changing rapidly. Mainly, the mix and multiple cropping method which is a unique feature of the rural agriculture has mainly been replaced by single cropping systems. This situation was clearly discernible through the observations conducted during the filed survey. The new monocultural aspect which engulf the multi crop cultivation system has mainly been caused on the extinction of traditional agricultural activities which ultimately generate many constraints. At the same time, number of other reasons caused on the reduction of the use of indigenous knowledge in agricultural activities undertaken by the women farmers could be identified. Accordingly, a series of constraints have been generated. Scarcity of knowledgeable elderly farmers and dearth of knowledge, decrease in the number of farmers who wish to engage in traditional farming practices, shortage of traditional seed varieties, threats of wild animals such as elephants, wild boars, monkeys, peacocks and porcupines, issues related to land management such as soil infertility, shrinking of home gardens, prohibition of chena cultivation by the government, labour scarcity generated through attitudinal changes and the orientation of young farmers towards new farming practices are the main constraints faced by the women farmers of the study area.

Conclusion

The existing applications of the indigenous knowledge related practices among the rural women farmers provide an impressive and vivid picture with a number of important findings. Women farmers of the study area endow with a wide array of practices generated through the indigenous knowledge which are already available among them. Agriculture is the main livelihood of the villages selected for the in-depth study. Women farmers therein are engaged in a number of important agricultural activities. These include land clearing and ground preparation, seed selection for cultivation, sowing, nursery management and transplanting, weeding, pest controlling, fertilizer application and plant protection, harvesting and threshing and storage and post harvesting. Occasionally, they undertake other heavy works such as protection of farmlands from wild animals, fencing, watering and other related practices which are carried out by men.

The overall findings of this study have been discussed under several sub sections such as an overview of the socio-economic and demographic profile of the respondents, different activities performed by them in the whole process of a cultivation season, existing indigenous practices employed by them and perceived benefits, factors impact on the extinction of indigenous knowledge and constraints faced by them in the application of indigenous knowledge in agricultural practices.

The overview of the socio-economic and demographic profile of the women farmers provides a detail account on few aspects such as the age, level of the education and the income they earn from agricultural activities. Accordingly, the age structure of the women included into the sample vary between 30 to 69 years and more. At the same time, it was considered about their level of the education and the seasonal income earn from the agricultural activities. The income earn by them for a cultivation season also range from rupees 3,000 to 30,000.

The second theme highlighted in this research is the nature of the cultivation which has been highlighted through few aspects. It includes the basis of the engagement, combination of the farming activities, land allocation and the crops cultivated. As per the data collected by the questionnaire survey, there are 36 farmers whose occupation is full time farming and the rest is engaged on part time basis. The farming activities undertaken by the surveyed women farmers fall into 07 categories and out of which the most famous method is chena cultivation followed by paddy farming and home gardening. Further, it was noted that many farmers simultaneously engaged in two or three types of farming activities. Among them, the most popular combination is paddy and chena cultivation followed by paddy and home gardening and chena and home gardening. The field survey also revealed some important facts about the extent of land allocated for agricultural activities. Accordingly, the smallest land extend is less than 80 perches and the largest land extent is more than 03 acres.

At present, a large variety of crops including traditional dry zone vegetables, grains, yams, legumes and other miscellaneous crops are being cultivated by the women farmers of the study area. In a detailed analysis, those could be categorized into three main categories i.e. the most popular varieties, moderately popular varieties and least popular varieties. The group discussions and case studies conducted with selected women farmers clearly emphasize that the popularity of the traditional grains and vegetables varieties are gradually declining due to the introduction of new hybrid varieties. At the same time, the traditional aspects of the rural agriculture are changing rapidly due to different reasons such as the rapid population growth, economic and market changes, educational development, modernization and development pressure. Due to different reasons, the mix and multiple methods of cultivation have now been replaced by single cropping systems.

As per the findings of the study, it could be noticed that a series of indigenous activities are being employed by women farmers in the whole process of the agricultural activities. In a detailed analysis, the activities could be categorized according to a sequential order of the different stages of cultivations and farmers are very knowledgeable about the perceived benefits of each application. Accordingly, indigenous knowledge is mostly applied in traditional manual weeding practices, storage and post harvesting, sowing, nursery management and transplanting, land clearing and ground preparation and seed selection. Application of indigenous knowledge in fertilizer application, plant protection, harvesting and threshing is limited. Even though the traditional bio-pesticide techniques play an important role in rural agriculture those are now becoming extinct. Further, the practicability and the popularity of the majority of indigenous practices have rapidly been declined due to different reasons such as technological advancements, introduction of chemical/mechanical agricultural inputs,

changes in land use patterns, changes in agricultural when indigenous knowledge is applied in their agricultural activities. Replacement of diverse farming practices by single cropping systems and dearth of knowledge due to the scarcity of knowledgeable elderly farmers mainly caused on the extinction of traditional agricultural activities and generate a number of constraints. At the same time, shortage of traditional seed varieties, threats of wild animals, land management issues and attitudinal changes of young farmers have also been identified as the other constraints faced by the women farmers of the study area. Despite such constraints and limitations, the application of indigenous knowledge in agricultural activities in Sri Lanka generate multifaceted advantages. Therefore, novel approaches, policies, practices and initiations are timely and significant to revitalize, re-emergence and perpetuation of the indigenous knowledge systems that has been preserved over centuries.

Reference

1. Abeywardana A, Schütt B, Wagalawatta T, Bebermeier W. Indigenous Agricultural Systems in the Dry Zone of Sri Lanka: Management Transformation Assessment and Sustainability (Online), Available at: https://www.mdpi.com/2071-1050/11/3/910, (Accessed on 25th November 2020), 2019.
2. Akhter A, Alamgir M, Sohel SI, Rana P, Ahmed SJM, Chowdhury MSH. The Role of Women in Traditional Farming Systems as Practiced in Home Ggardens: A Case Study in Sylhet Sadar Upazila, Bangladesh, *Tropical Conservation Science*,2010:03(01):17-30.
3. Aluko YA. Women's Use of Indigenous Knowledge for Environmental Security and Sustainable Development in Southwest Nigeria, *The International Indigenous Policy Journal*,2018:09(03):01-23.
4. Anyoha NO, Aja OO, Nwozuzu SO. Women Farmers' Perceived Reasons for Use of Indigenous Knowledge in Crop Pests and Animal Diseases/Disorder Management in Imo State Nigeria, *World Journal of Agriculture and Soil Science*,2021:06(03):01-06.
5. Department of Census and Statistics, Sri Lanka Labor Force Statistics Quarterly Bulletin (Online), Available at: http://www.statistics.gov.lk/Resource/en/LabourForce/Bulletins/LFS_Q1_Bulletin_2020, (Accessed on 14th December 2020), 2020.
6. Food and Agriculture Organization of the United Nations, Country Gender Assessment of Agriculture and the Rural Sector in Sri Lanka, (Online), 2018. Available at: https://www.fao.org/3/CA1516EN/ca1516en.pdf, (Accessed on 02nd January 2021).
7. Grantham K. Gender and Indigenous Knowledge: The Role of Nepalese Women in Agricultural. Research and Development (Online), 1996. Available at: https://assets.publishing.service.gov.uk/media/57a08db840f0b649740019e6/R6322Genderandindigenousknowledge.pdf, (Accessed on 10th December 2020).
8. Kazmi T, Chaudhry AG, Ahmed A, Shaheer Ellahi Khan SH. Farmers Beliefs about Indigenous Farming Practices and Sustainable Agricultural Development (Online), Available at: https://www.cabi.org/GARA/FullTextPDF/2014/20143294449.pdf, (Accessed on 10th January 2021), 2014.
9. Mishra, Anupam, Singh SRK, Raut AA. *Traditional Knowledge in Agriculture*, Division of Agricultural Extension, ICAR, New Delhi, 2020.
10. Olatokun WM, Ayanbode OF. Use of Indigenous Knowledge by Rural Women in the Development Of Ogun State, *INDILINGA – African Journal of Indigenous Knowledge Systems*,2008:07(01):47-63.
11. Seleti YN, Tlhompho G. Rural Women Subsistence Farmers, Indigenous Knowledge Systems and Agricultural Research in South Africa, *Journal of Human Ecology*,2014:48(01):33-41.
12. Ugboma MU. Availability and Use of Indigenous Knowledge Amongst Rural Women in Nigeria (Online), Available, 2014. at: https://digitalcommons.unl.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=3028&context=libphilprac, (Accessed on 14th December 2020).