1. INTRODUCTION

1.1 INDIAN AGRICULTURE

India is predominantly an agricultural country. Indian agriculture has its origin from the very beginning of evolution of the civilization. Starting from nomadic, hunting, fishing and gathering stage to the hoeing and tilling of the soil, it has come a long way to reach the present status. Today, the agriculture in India is one of the most prominent sectors in its economy. Agriculture and allied sectors accounted for 16.6 per cent of the GDP in 2007 and employed 60 per cent of the country’s population. It accounts 8.56 per cent of the total Indian exports. About 43 per cent of India’s geographical area (about 142 million hectares) is used for agricultural activities. Out of this cultivated area about 57 million hectares is under irrigation. In 1947, India was producing only 50 million tonnes of food grains but today with the same amount of land it has produced 223 million tonnes of food grains during 2007-08 to feed over 1000 million population accounting 18 per cent of the world’s population. India is the largest producer of coconuts, mango, banana, milk and dairy products, cashew nuts, ginger, turmeric and black pepper and it is also the second largest producer of rice, wheat, sugar, cotton, fruits and vegetables. The demand for food grains has been continuously increasing. It is estimated that the population will grow to 1.4 billion by 2025 and 1.7 billion by 2050 AD, needing annually about 380 and 480 million tonnes of food grains respectively (Yadhav et al., 2000). Therefore, Agriculture across the expanse of India- is heralding the country’s second Green Revolution to meet the growing demand for food grains and attain sustainable food production.
1.2 AGRICULTURE IN KARNATAKA

Karnataka is one of the important states as far as Agriculture is concerned. Karnataka is said to be a mini India as it has wide variety of soil and climatic conditions, which are seen in India. As such all the crops, which are cultivated in India, are being cultivated in Karnataka profitably. Karnataka has a geographical area of 19.05 million hectares, out of which 10.2 million hectares is under cultivation with irrigation facility for only 2.38 million hectares. Major area is under rain fed conditions subjected to vagaries monsoon conditions. Karnataka state has been divided into ten Agro climatic zones based on soil and climatic condition. The important crops cultivated include paddy, ragi, jowar, bajra, maize, wheat, minor millets gram, tur, green gram soyabean, groundnut, sugarcane and cotton. Many horticultural and plantation crops are also cultivated in the state. Cropping pattern vary from region to region based on soil type, climate and water (Annon 1996) availability. In addition the farmers practice variety of cropping systems and farming systems. Along with agriculture farmers will have either dairy or Poultry or sericulture.

Karnataka has made a name in the world by releasing long staple cotton interspecific hybrid for the first time. Similarly it has released many high yielding varieties in wheat and rice, which have been grown in many other states. Agricultural Universities and Department of agriculture for state have been identifying women farmers every year based on their agriculture practices, production "Best women farmer" award to encourage those who are involved in Agriculture and other allied activities. This practice is in vogue for the last many years. As such many women farmers have been identified for their achievement in agriculture.
1.3 WOMEN IN AGRICULTURE

A woman is the moulder and builder of any nation’s destiny. They play a significant role in any economy. They are regarded as the backbone of the rural scene. Most of the women perform various types of work for their livelihood and agriculture is considered as the biggest organized sector where large number of rural women takes part actively. About 75% of the Indian female population is from rural families, who belonged to the small, marginal farmers and landless labours (Census of India, 1991). Though women’s primary responsibility is in indulging domestic work, greater emphasis is laid on women earning in the form of money by working outside the four walls. In India a significant proportion of the population are below the poverty line and it is a fact that labour force participation will increase with poverty, a large portion of rural women are under pressure to participate in the labour force.

Indian rural women are extensively involved in agricultural activities. However the nature and extent of their involvement differs with the variations in agro production systems. The mode of female participation in agricultural production varies with the land owning status of farm households. Their roles range from managers to landless labourers. In over all farm production, women’s average contribution is estimated at 55% to 66% of the total labour force with percentages, much higher in certain regions. In the Indian Himalayas a pair of bullocks works 1064 hours, a man 1212 hours and a woman 3485 hours in a year on one-hectare farm, a figure that illustrates women’s significant contribution towards agricultural production (Shiva FAO, 1991)

The impact of W.T.O rules and policies of trade liberalization in the agriculture sector on women is distinctive for four reasons. Firstly, women have been the primary seed keepers, processors. They have been the both experts and producers of food, from
seed to the kitchen. W.T.O impacts women's expertise and productive functions throughout the food chain. The Trade Related Intellectual Property Right (TRIPS) agreement impacts women's knowledge of and control over seed. The Agreement on Agriculture impacts women's livelihood and income security, and also has a direct impact on women's expertise and economic role in agro processing. Secondly, as globalization shifts agriculture to capital-intensive, chemical intensive systems, women bear disproportionate cost of both displacement and health hazards.

Thirdly, women carry the heavier work burden in food production because of gender discrimination get lower returns for their work. When WTO destroys rural livelihoods, it is women who loose the most. When WTO rules allow dumping which leads to decline in prices of farm products, it is women already with low incomes, which may go down further. Fourthly, their position vis-a-vis WTO is also more vulnerable because as the livelihoods and incomes of farmers in general, and women agriculturists in particular are eroded, they are displaced from productive roles, women in agriculture and their status is further devalued, while the patriarchal power of those who control assets and benefits from asset transfer due to globalizations is increased, other social processes are triggered which result in increased violence against women.

According to population census of India 2001, there are 495 million women which accounts to 48.27% of the total population. Out of the total main workers population, female workers comprise 22.56% and 60.89 % as marginal worker. About one third of women population is actively engaged in agricultural activities.

According to Swaminathan, the famous agricultural scientist, "some historians believe that it was woman who first domesticated crop plants and thereby initiated the art and science of farming. While men went out for hunting, women started gathering seeds
from the native flora and began cultivating those of interest from the point of view of food, feed, fodder, fiber and fuel".

Women have played and continue to play key role in the conservation of basic life support systems such as land, water, flora and fauna. They have protected the health of the soil through organic recycling and promoted crop security through the maintenance of varietals diversity and genetic resistance. Therefore, without the total intellectual and physical participation of women, it will not be possible to popularize alternative systems of land management to shifting cultivation, arrest gene and soil erosion, and promotes the care of the soil and the health of economic plants and farm animals.

That women play a significant and crucial role in agricultural development and allied fields including in the main crop production, livestock production, horticulture, post harvest operations, agro/social forestry, fisheries etc. is a fact long taken for granted but also ignored. The nature and extent of women's involvement in agriculture, no doubt, varies greatly from region to region, even within a region, their involvement varies widely among different ecological sub-zones, farming systems, castes, classes and stages in the family cycle. But regardless of these variations, there is hardly any activity in agriculture production, except ploughing in which women are not activity involved. In some of the farm activities like processing and storage, women predominate so strongly that men workers are numerically insignificant (Aggarwal, 2003). Studies on women in agriculture conducted in India and other developing and under developed countries all points to the conclusion that women contribute for more to agricultural production than has generally been acknowledged. Recognition of their crucial role in agriculture should not obscure the fact that farm women continue to be concerned with their primary functions as wives, mothers and homemakers.
Despite their important role in agriculture production, women face severe handicaps. They are in fact the largest group of landless labourers with little real security in case of break-up of the family owing to death or divorce; inheritance laws and customs discriminate against them. Land reforms and settlement programmes usually give sole title and hence the security needed for obtaining production credits to the husband. Agriculture development programmes are usually planned by men and aimed at men. Mechanization, for example alleviates the burden of tasks that are traditionally men's responsibility, leaving women's burdens unrelieved or even increased. The excess burden of work on women ("the double day" of the farm work plus house work) also acts as a stimulus to have many children so that they can help out with chores from an early age. Extension workers almost exclusively aim their advice at men's activities and crops. In some regions, this bias may depress production of subsistence food crops (often women's crops) in favor of increased production of cash crops (often men's crops) so that family nutrition suffers. It may not be out of place to mention here that considering their dual responsibilities within and outside the home, it would be in the fitness of things that more and more in the village trainings are organized for rural farm woman to suit their convenience with due realization that institutional training is important in its own place.

According to 1991 census the male cultivators has increased in the country by 11.67 % from 76.7 in 1981 to 85.6 million in 1991. The female cultivators however have increased at much faster rate of 45.23 % from 14.8 million in 1981 to 21.5 million in 1991. The number of male agricultural labourers increased by 31.48 %, but that of female by 36.45 %. The entire female working forces (74%) is engaged in agriculture operations. About 60 % of agricultural operations like sowing of seeds, transportation of saplings, winnowing, storage of grain etc. are handled exclusively by women, while in other jobs
they share the work with men. Apart from participation in actual cultivation, women participate in various forms of processing and marketing of agricultural produce (Aggarwal, 2003).

1.4 SUSTAINABLE AGRICULTURE

A massive application of science and technology has enabled Indian agriculture to face the serious challenges of poverty, food security and malnutrition in the recent past. Concern about the effect of such methods on the quality of the environment, food supply, health of producers and consumers and the viability of family farms and rural communities which have motivated farmers and researchers to search for alternative and modification to these conventional agriculture systems. One of the most popular alternatives to emerge in the past (1990’s) is sustainability in agriculture which is becoming a matter of increasing concern and order of the day in recent years. Agriculture from time immemorial supports mankind by providing food, fiber, fruits, fuel, raw materials to agro based industries and employment to a large proportion of population, particularly in developing and underdeveloped countries. The advancement of science and technology in the field of agriculture through sustained research efforts has paved the way for transformation of traditional agriculture into commercial endeavour slowly during the past four decades. The success of commercial agriculture depends upon the efficient management of resources.

Sustainable agriculture started to generate significant interest in the 1980s. It has come to represent not just a different set of technologies to conventional agriculture, but an alternative belief system as well. However, it has come to serve as an umbrella term for alternative agriculture, agro ecology, low-input agriculture, permaculture, biological agriculture, regenerative agriculture and organic agriculture. Sustainable agriculture is
belief system, emphasized reduced chemical use, the view of the world as a global village, respect for nature, and family and group self-reliance (D’Souza 1998). It integrates three goals: environmental health, economic profitability, and social and economic equity (Malkina-Pykh and Pykh, 2003).

Many traditional agricultural practices around the world refrain from using chemical fertilizers and pesticides. They do this for various reasons: by tradition, because farmers cannot afford agrochemicals, they cannot buy them locally, or they do not know how to use them. This traditional form of organic agriculture is not necessarily sustainable, even though it has been adapted to local conditions over many generations. Population growth, declining prices insecurity, loss of diversity, soil degradation and other environmental problems, in these many instances traditional forms of agriculture can no longer produce enough income and a secured livelihood. Hence there is an urgent need for more sustainable approach for the agriculture to make it more profitable without degrading natural resources.

1.5 WOMEN FARMERS IN SUSTAINABLE AGRICULTURE PRACTICES

Sustainable agriculture can be explained as practices that meet current and future social needs for food, fiber and for ecosystem services for healthy lives. Production intensive methods that have been used in agriculture during the past 50 years affected the quality of the environment, the food supply, the health of producer and consumers are made visible by family farms and communities. These inadvertent and detrimental impacts have created a need to search sustainable agriculture practices as an alternative for modification to conventional agriculture systems. Compared to men, women in rural areas of developing countries spend long hours working in farming activities. There is considerable various types of activities they participate in and the amount of time they
spend on those activities. This variation is due to a number of factors such as type of farm, farming background, physical ability, personal preference, interest, number of children, family setup, social freedom etc. Despite the different levels of their involvement in farm work, these women are acquainted with all activities, which take place on their farms. Women's goal, values and beliefs are intimately bound up with their views of sustainable agriculture. They want to improve the quality of life of their families, support their local communities, live in balance with nature and preserve family farms. Indian farmers especially women are the primary consumers of all the resources that is why before using new tools for sustainability, it is necessary to keep their views, demands and comforts on priority. Unfortunately in our rural communities, women remain completely unfamiliar with recent methodology / technology because they are not even consulted when new technology is introduced.

Technological change is a factor in women's lives everywhere. In fact science, technology and development are being increasingly seen as patriarchal projects and the shift from an organic relationship between people and nature to an exploitative one that has been created by science and technology poses the problem of survival for women in rural societies. Men's fascination with big machines that control the agriculture environment is a well-known aspect of rural culture. It is often observed, “Masculinisation of farming became particularly marked after the mechanization of the agriculture”. The impositions of export oriented agricultural production to feed the global market along with the growing process of mechanisms is displacing labour and adversely affecting women in the rural societies. There is a growing concern regarding marginalization of women and erosion of women’s control over productive resources. This is particularly causing concern due to more number of women being pushed to the agricultural sector and on the other
hand there is a paradoxical situation of erosion of women's rights over productive resources in the rural countryside. Gender consideration are extremely important in terms of the socio-economic impact because in developing countries women are often responsible for cultivating food crops, providing water for household and cattle needs, gathering fodder and fuel wood and performing most other activities that sustain the family. But women in those societies do not have a significant role in decision making of how food is to be grown and what technology is to be employed.

1.6 DEFINITION OF THE PROBLEM

The role of women in Agriculture and allied fields is considered very important from early times. It is women who started crop cultivation around their dwellings when they found their husbands reaching home late after collecting tubers and fruits from the forests. This way even today, the rural women are fully engaged in agriculture.

Rural women are obliged to attend to all the household chores, children’s welfare, and family cohesion along with farm work. Women play an important role in all stages of crop production, starting from land preparation to harvest and post harvest processing. The type and extent participation by farm women in farm operations vary from place to place. However farm women or women farmers are involved to greater extent in food production and family protection. As such they cannot be over looked. Women feed the world is the traditional and realistic perception of the role of the women within the family and with in the community.

In past years more and more women are taking active participation in agriculture and allied sector. Due to the more seasonal migrative by the men for the search of better paid jobs in urban areas. Men impose extra burden on women and for this reason women
are becoming farmers and managers in their farms. Today's agriculture needs to be managed more scientifically to increase productivity and production with degrading natural resources. In addition there is a need to attain sustainability in agricultural production. Lot of new technologies are being developed which need to implemented to attain for higher production, and maintain sustainability.

There is a feeling that agricultural extension services do not attach much importance in reaching women farmers or women engaged in agricultural and allied activities. Policy makers and administrators typically still assume that men are the farmers and women play only a "supportive role" as farmers wives (Samanta, 1994). This attitude needs to be changed, Extension services need to address the women farmers in order to upgrade their knowledge and skill so as to improve agriculture make it more productive.

Sustainable agriculture is the need of the hour to make the agriculture viable in all respects. It is a set of farming practices, which can continue to maintain the farm productivity, efficiency and profitability in the long run, without depleting the natural resources and the environment. The main factors for sustainable agriculture are high soil productivity, supply of balanced nutrients, efficient water management, improved crop varieties, better plant protection, post harvesting management for value addition and marketing. (Jaganathan 2001)

There is an urgent need to collect information on the role of farm women and particularly those engaged in farm as women farmers. The extent of technological practices adopted by them in their farms, problems being faced, extension services available, loan facilities, availability of inputs, marketing facilities, regular guidance etc., need to be identified. This would help the concerned to make suitable changes in their activities to help the women farmers to produce more and make the Agriculture more
sustainable and profitable. The present study would be able to address all these problems and help to workout the remedial measures and appropriate documentation of the women farmers' involvement in sustainable agriculture. Such documentation can throw light as the needs of women farmers involved in sustainable agriculture and their impact on family economy.

1.7 NEED FOR THE STUDY

Women play a significant and crucial role in agriculture development and allied fields including crop production, livestock production, horticulture, post-harvest operation, agro/social forestry etc. The prosperity and growth of a nation depends on the status and development of its women, as they not only constitute nearly half of its population, but also influence growth of the remaining half of the population. The figures from the International Labour Organization reveal that women are responsible for 50% of food production in the developing world. There are hardly any activities in agricultural production in which women are not actively involved. Seasonal migration by men counterparts imposes an extra burden on women, as they have to cope with dual responsibilities of own farm/wage labour and managing their children. Under these conditions, women's participation in agriculture increases. Despite their major contribution to agricultural production and performing a large number of other activities, women were put under house-wifezation and thereby excluding women altogether from the purview of policy making. In fact the agricultural development system has not yet taken farm women population seriously in the mainstream of its development processes.

In terms of participation, women's role as producer and provider of basic needs are often conflicts with others and women's ability to perform the multiple of tasks with
efficiency is affected by their level of skill as well as by availability of time, resources and support system. The long hours of hard work which women spend on agricultural and home maintenance tasks tire them and affect their health and level of productivity.

Any organization which is concerned about the productivity of the farmers who happened to be a woman must be concerned about her ability to manage her multiple roles and the technology and the support system. She needs to enhance her productivity as a farmer. The needs and interest of women engaged in agricultural are often un recognized, ignored and is seen as unimportant. Agriculture development strategies that address only the welfare of men farmers not for the women farmers, which can not be sustainable; any development strategy aimed at accelerated agricultural growth must ensure that women farmers have better access to the means of production.

Sustainability of agricultural development and improvement of natural resources requires the active involvement of women more than that of men. But this cannot be achieved and maintained if women do not profit from the activities. It is crucial to understand that resource-poor men and women farmers share many needs, interests and constrains. But in addition, women farmers face more obstacles and barriers because of technologies they use, their cultural status and their functions in the family and in the society.

Planners do not routinely collect statistics: policy makers and administrators remain unaware of the significant percentage of land cultivated by women and their economic contribution to their family, as well as nation. Women's key contribution to food security at the household, regional and national level is similarly ignored. Many new technologies have simply increased the labour burden women farmer without increasing their share of farm revenue. Appropriate technologies related to agricultural processes and
Homestead production tend to be overlooked by development workers which could make an important contribution to the quality of life and productivity of rural women farmer. Both men and women are substantially and essentially contributing to agricultural development. In practice, women are increasingly being involved in agricultural production system due to socio-economic changes. To be sustainable, a farming system must generate a level of production that satisfies the material (Productivity) and social (identity) needs of the farm household, within certain margins of security and without long term resource depletion.

Training is an important component of HRD that enhances knowledge, skill and attitude. For building technical competency among farm women, need-based skill-oriented training programmes to reinforce their role in farm activities need special attention. The training programmes should initially be organized on their felt-needs and then best switched over to unfelt but essential needs. To achieve this sacred task, infrastructure facilities in terms of more numbers of KVKs and FTCs should be established on priority basis. They must be in the reach of rural farm women and women farmers.

In order to cater to the technologies needs of farm women, women specific technologies should be developed. While evolving agricultural technologies, indigenous practices used by women should be paid due attention for blending with the frontier ones for greater adoption.

Technological upgradation is necessary for increasing the work efficiency of women in various agricultural activities. Various issues which needs attention while deciding on the technological options are formulation of an inventory of technology options in the traditionally women dominated areas of operation, macro and micro level assessment of the impact of the modern farming technologies on the employment potential
of women in agriculture, front line technological options with a promise to fit into the environment of women in agriculture etc. For transfer of technology understanding of the cultural norms of the community is vital. The importance of training for transferring information and technology and training programmes for rural women's should be well planned and should be given in small groups in an interactive and participatory mode for greater effectiveness while creating awareness among the rural women farmers.

In Karnataka, as a matter of fact a very few systematic and scientific empirical studies have been carried out concerning to the role of women farmer, in sustainable agriculture practices and its impact on family economy. There is a need to study the role of women farmers in management of agriculture, adoption of technologies constraints by the women farmers, economic contribution for sustainability attained etc. Keeping this view, an attempt has been made in this study specifically to depict the contribution of rural women as women farmers in agriculture sectors. This would help to address the needs of women farmers so that their skill and management ability is increased which helps in improving agricultural productivity and production and maintaining sustainability for their enhancement of family economy.
1.8 OBJECTIVES

Women play an important role in agricultural activities and her contribution is quite significant. However as women, experiences many problems due to three pronged activities but systematic study has not been made. Hence the study entitled “Women workers in Sustainable Agricultural Practices - Impact on Family Economy” has been taken up with the following objectives

1. To find out the agricultural practices prevailing in the northern transitional zone of Karnataka state
2. To analyse the prevailing agriculture practices with respect to its sustainability based on effective use of resources, technology adopted, economically viable and socially acceptable etc.,
3. To sensitize women workers for ecofriendly approaches to agricultural practices,
4. To identify/ study the impact of sustainable agriculture on family economy

1.9 Assumption

1. There would be participation of women in the process of all agriculture related activities
2. There would be some of the agriculture practices that are sustainable which are practiced by the women farmers
3. There would be lack of awareness among women farmer about sustainable agriculture
4. There would be positive impact of the sustainable agriculture practice in enhancement on family economy
Hypothesis:

1. Training influences the sustainable agricultural practices in women farmers.

2. Adoption of women farmers in their field is associated with sustainable agricultural practices like: Land Resources management, Organic farming, Integrated Farming, Natural Farming, Integrated nutrient management, integrated pest management, Agro forestry and water conservation.

3. Sustainable agricultural practices influence family annual income of the women farmer.

4. Institutional support along with training and adoption of technology improves the agricultural production.
1.10 PRESENTATION OF THE STUDY

The study made on “Women workers in sustainable agricultural practices- Impact on family economy” is presented in five chapters. The first chapter introduces the subject matter with relevance of the present study. In the second chapter relevant studies carried out in India and outside are reviewed. The third chapter elaborately explains the location of research conducted, design adopted for the research, data collection tools, method of data collection and the techniques adopted for the data analysis. A detailed presentation of research results obtained from the study is covered in the fourth chapter along with possible reasons for the results of the study in discussion. Lastly, the summing up of the findings and conclusion of the study are presented in fifth chapter.

1.11 OPERATIONAL DEFINITION OF THE TERMS USED IN THE STUDY

1.1a Farm women

Women who are doing farm work or working as an agricultural labourer in the other land or own land and or allied activities is called Farmwomen.

1.1b Women Farmer

Women who is managing the farm or managing agricultural task on their own land and allied sector and having decisions making power for purchasing and marketing.

1.1c Man days

The number of man days spent per year on each activity was calculated by using average time spent per day and average number of days the activity is performed per year.

1.12 Sustainable Agriculture
Sustainable agriculture is a complex phenomenon, difficult to define by a single agricultural practice. However, sustainable agriculture is defined as a proper combination and appropriate use of seven sustainable agricultural practices viz., Organic farming, integrated pest management, integrated nutrient management, agro forestry, soil and water conservation and bio-fertilizer use for conservation and management of natural resource base while preserving high productivity and quality of land with social and economic viability.

**12a. Organic farming**

Organic farming is a system of agriculture which encourages nutrient recycling of organic matter to soil and using compost, crop residues, proper tillage and avoiding application of synthetic fertilizers and pesticides. It emphasizes more on use of organics.

**12b. Integrated farming**

Integrated farming is a system of sustainable farming where a set of practices were integrated into the farming system to achieve profits from the farming and at the time help to save the environment.

**12c. Integrated Pest Management (IPM)**

Integrated Pest Management is a holistic approach by integrating cultural, mechanical, physical, biological, chemical, genetic and regulatory methods to control pests.
Integrated Nutrient Management (INM)

Integrated Nutrient Management is a holistic approach by judicious use of inorganic fertilizers along with organic and natural sources and bio-fertilizers to maintain and enrich soil fertility, sustainability and production levels.

Soil and water conservation

Soil and water conversation is a scientific management of soil and water to enhance soil fertility, productivity and moisture by bunding, tillage, constructing ponds etc.

Bio-fertilizer

Microbial inoculants popularly known as bio-fertilizer refers to living or latent cells of efficient strains of micro organisms that are capable of fixing atmospheric nitrogen and mobilization of soil nutrient.

Natural Farming

Natural farming is a system of farming where no alterations were made either to the soil or to the plant. The farming is taken care by nature.