REVIEW OF LITERATURE
2. REVIEW OF LITERATURE

An effort has been made here to review the literature available in India and outside on the performance of the farm women, women farmers engaged in sustainable agricultural practices, problems being faced by women farmers, solutions available is reviewed in this chapter under sub-headings.

2.1. Socio-demographic characteristics of women farmers

2.2 Agriculture activities performed by the women farmers

2.3 Eco-friendly agricultural approach

2.4 Sustainable agriculture

2.5 Sustainable agricultural practices performed by the women farmers

2.6 Training needs of women farmers in sustainable agriculture activities

2.7 Economic contribution through agriculture by the women farmers

2.1. SOCIO-DEMOGRAPHIC CHARACTERISTICS OF WOMEN FARMERS

The study conducted in Kangra district of Himachal Pradesh observed that the majority of the respondents were of middle age group (4-8 members), and having medium sized families (more than four members) (Neetu Sharma and Asha, 2004).

Sumitra and Lali (2004) conducted a study in Mahendergarh district of Haryana state and found that the 28.0 per cent of women had an age of range of 31 to 45 years. Regarding family size it was found that sixty per cent of the respondents having medium sized (5-8 members) in a family.
The study carried out by Sudershan and Achala (2004) in Haryana state reported that 57.66 per cent of farm women were illiterate.

Anita and Sudershan (2004) studied the farm women of Haryana where central sector scheme, ‘women in agriculture’ funded by Government of India is operating since 1994-95. It is noted that 77.50 per cent of farm women are illiterate, and medium sized family (45.0%). Majority of respondents (91.25%) had farming as their main family occupation.

Hema Pandey (2005) concluded that the illiteracy is one of the biggest curses, which leaves women handicapped. This is one of the foremost factors responsible for backwardness and poverty among women. Due to illiteracy women are forced to work as unskilled labourers. Investing in human capital has proved to be one of the most effective means of reducing poverty and bringing about sustainable economic growth. One study on agricultural productivity showed that four years of primary education increased farmer’s productivity by upto 10 per cent and the benefits of education for women farmers can be even greater.

Arya (2005) study conducted in Uttarakshal reported that the women constitute nearly half of the resource in the country of which 77 per cent belongs to rural areas with agricultural as the major occupation. Nearly 84 percent of all economically active women in India are engaged in agriculture and allied activities.

Indu et al. (2005) found that the profitability of the farming venture with majority (35%) having income in the range of Rs. 30,000 – Rs. 50,000 in vegetables farming compared to 27.5%, 25% and 22.5% having income in the range of Rs. 10,000-Rs. 30,000-Rs. 50,000 – Rs.50,000 to Rs.1 lakh in wheat farming respectively while in dairy
farming respectively while in dairy farming majority of 35% had income between Rs. 10,000 to Rs. 30,000 and 20% had income above Rs. 1 lakh.

2.2 AGRICULTURE ACTIVITIES PERFORMED BY THE WOMEN FARMERS

Sharma and Singh (1970) identified nine operations in which women actively participate, those were seed storage, winnowing, care of animals, harvesting, weeding, soak pit, sowing, applying manure in the field, and using implements. They further found that women participate in large proportions in four farm operations, viz., seed storage (75%), winnowing (75%) care of animals (74%) and harvesting (11%) in comparison to men.

Arnon. (1981) observed that smaller the farm lower was the income and more primitive was the technology and greater was the proportion of women in the farm labour force. Female work participation rate increased when males found part time work off their own farms. Conversely, with a rise in farm income, there was generally a decrease in the participation of women in the farm labour force.

Ghodke and Ryan (1981) found that in semi-arid tropics of Peninsular India on smaller size farms, family women were the major source of labour input for crop production and there was an inverse relationship between farm size and proportion of female labour availability.

Bardhan (1985) found that women in North and Western India did vast amount of work necessary for farming (mostly pre and post harvest operations) and cottage industries that were essential to sustain the cash needs of peasant farming and to see through the dead seasons. Rural women, apart from growing vegetables for the kitchens, preparing fodder and caring for the animals, cooking, working in cottage industries, carry out a
range of extremely labour and skill intensive operations crucial in crop production and processing crop.

According to Agarwal (1985) factors like economic class and caste affect the supply, while technology affects the demand for women's work participation outside the house. Due to prestige consideration women in better off households usually did not undertake manual work on fields. She also noted that the agricultural tasks done by men and women are culturally determined rather than biologically.

Datta and Sharma (1985) evaluated the contribution of female labour vis-a-vis male labour in agriculture in Ranchi district (Bihar) during 1983-84. They found that the percentage of female labour input was significantly higher in small and medium sized farms. Women performed lighter works like transplanting of paddy exclusively and weeding and harvesting jointly, with male labour.

Jaiswal and Singh (1985) studied the pattern of employment in rural areas of Uttar Pradesh during 1983-84. They found that women labour got 270 days of employment per annum of which 85.56 per cent was from agricultural sources and the rest from non-agricultural sources. The highest employment to the extent of 32.68 per cent was found in harvesting, threshing and winnowing. Intercultural, sowing and irrigation accounted for 13.20, 12.99 and 12.99 percent of the total employment, respectively. Highest employment was found during the months of April, May and November and January, while the lowest was during July, August and September.

Vinodkumar et al. (1985) assessed the extent of women employment in modern agriculture in Meerut district of Uttar Pradesh in 1984-85 Out of 307 days of employment per annum, 66 percent was derived from agriculture and 34 percent from non-agriculture. Harvesting, threshing, winnowing, interculture, maintenance of cattle, application of
manure and fertilizers, sowing and land preparation were the agricultural operations in which women were employed.

Joshi and Aishi (1985) observed that adoption of high yielding varieties of cotton and jowar in Akola district of Maharashtra increased the requirement of casually hired female labourers to a labour seeking agricultural wage employment. Fertilizer application, interculture, harvesting and threshing were the main operations performed by female labour in jowar and cotton picking were done by only women.

In the Indian Himalayas a pair of bullock works for 1064 hours, a man works for 1212 hours and women work for 3485 hours in a year on one hectare, a figure that illustrates women's significant contribution to agricultural production (Singh, 1989).

Shashikala (1990) found that women participated in farm activities like, harvesting, weeding, transplanting and threshing and participated less in the activities like application of manure, digging trenches, irrigation channel making.

The role of women in agriculture ranges from land labourers to managers. In the overall farm production, women's average contribution is estimated at 55 to 66 per cent (Venkateshwaran, 1992).

Pawar et al. (1993) in their study on contribution of farm women in agriculture indicated that the proportion of work days contributed for heavy manual work, light work and upkeep of livestock to the total employment days were 12.75, 24.75 and 12.96 per cent for women workers respectively. The relative contribution of heavy manual work in the total employment days showed declining trend as the size of holding increased and thus established an inverse relationship in the case of women workers. The heavy manual work contributed by women workers ranged between 61.43 and 80.08 days. The contribution of women workers for upkeep of livestock increased in accordance with
increase in size of farms. The study concluded that upkeep of livestock and crop productivity were the major source of employment for women.

Chand and Sharma (1999) stated that the association of tribal women in agriculture/horticulture is an age-old practice. Their roles as co-partners in the farming profession cannot be questioned. Though they have to do multifarious duties in agriculture and allied fields, yet there is hardly any appreciation and recognition of their extensive contribution. Agriculture in the remote and hilly regions of the country is largely in the hands of the women. They also reported that the tribal women spend more than six hours carrying out various farm operations and also actively involve in decision-making.

A study was conducted in Lunawas and Narnadi cluster of rural areas of Jodhpur on 100 farm women based on cluster sampling methods. Rural woman's work participation in agricultural activities was studied. The study revealed that the agricultural activities were classified into 16 other smaller activities based on different aspects of crop cultivation. A number of studies explain the extensive participation of women in these farm operations but contribution of women in arid zone is limited owing to rain fed conditions. Men and women jointly do pesticides and intercultural operations in 73 and 58 per cent cases, respectively. Men and women jointly perform the arduous task of crop harvesting (76%). The traditional task of storage was done by women. The commercial activities of marketing the grain are the responsibilities of men (Tewari et al 1996).

According to Monika and Sawhney (1999) revealed that, threshing includes sub-activities like opening up bundles and handling over small bundles of harvested crop to person operating the thresher, grain collection and filling containers, storage and disposal of water, hand threshing and supervising. Women were involved in all of these activities. Size of land holding wise majority of those doing physical work of opening up bundles
and handling them/or feeding the thresher were from families holding less than 2.5 acres of land. No one from families holding more than 10 acres of land was involved in the activity of feeding thresher.

Padmanabhan (2001) conducted a study on the women empowerment in farm sector. The results of the study indicated that maximum participation of respondents was in harvesting operations specially wheat harvesting, followed by vegetable picking, rice transplanting, fodder cutting, potato plucking and hoeing as disclosed by 90.83, 89.16, 85.83, 83.33 and 57.50 per cent, respectively. Farm operations rarely done by the respondents were worthing out sugarcane and maize produce; cotton plucking and legume crop sorting as indicated by 36.66, 32.50, 26.66 and 25.83 per cent, respectively.

Sawant et al. (2002) observed that among the identified farm activities harvesting of grass was the major activity, which provided employment to all the respondents. The farm activities such as weeding (97.84%), uprooting and transplanting the seedlings (96.40%) and harvesting of cereals (93.52%) also provided employment to the farmwomen to a maximum extent.

Borah and Kalita (2002) revealed that, the average time devoted by women in agricultural operation was 8 to 9 hours in a day in peak season and 4 to 5 hours in slack season. Except ploughing, cart driving, and arranging inputs and marketing farm produce, women help in carrying out all other farm operations like compost making, sowing, weeding, application of fertilizer and manure, application of irrigation, protection from birds, harvesting, threshing, measuring, winnowing, drying, stacking and carrying.

Kavita and Reddi (2002) documented that farm women from marginal land group spent 34.3 per cent of time in total farm activities followed by small (33.7%), medium
(33.1%) and big (31.1%) land holding farm women with significant difference between the farm groups regarding time utilization pattern in total farm activities.

Geetalaxmi, et al. (2002), found that, majority of the women respondents in both the areas (rainfed and irrigated) participated regularly in activities like weeding, harvesting, winnowing and transplanting.

Gill et al. (2002) conducted a study on participation of women in agricultural and allied activities. The study was conducted in three agro climatic regions of Punjab and multistage stratified random sampling technique was used to select the sample. The results of the study indicated that both farm and non-farm women participated in pre-sowing and post-sowing activities. The farm women were mainly involved in the supervision and decision making (land preparation, seed selection, treatment of seeds, sowing and nursery rising) but their participation was visualized to a limited extent. They also found that the farm women did perform activities such as picking of cotton, unsheathing of maize cob and the average mean score of farm women’s participation in harvesting operations was 0.196. In post-harvest operations, drying, winnowing, cleaning by sieving and storage of seeds and grains, were the activities, which both farm and non-farm women were performing by themselves with average score of 0.744 and 0.905, respectively.

Bijay and Rukma (2002) conducted a study in Garhwal region of Uttaranchal to know the role of women in agriculture and other allied activities. Stratified random sampling was used, for which the whole area was divided into three stratas based on the altitudes of the area. The results showed that the women devoted 212.68 man-days per year for agricultural activities. Operation wise time devoted by women was found highest in intercultural operation (26.02%) and sowing of crops covered 16.39 per cent of the total man-days. In field preparation women spent 14.27 per cent man-days. Women devoted
14.56 per cent man-days in manuring and fertilizing of the fields. The study concluded that the role of women in agriculture and other allied activities was substantially higher in comparison to their male counterparts.

Manju and Abha (2002) studied the work profile of rural women of Rajasthan in agriculture and allied activities. The results showed that 81.10 per cent women performed the task of harvesting always jointly with the male workers. Similar trend was observed in activities like seed selection, application of manure and fertilizers, weeding and plant protection measures. With regard to post harvest activities, women played a vital rôle. Findings reflect that dehusking and threshing were always performed jointly with male members in majority of the families. The activities like cleaning, drying and storage for household consumption and processing were the female dominated activities as these were performed either with the help of other female members (30.80 to 54.20%) or independently (7.30 to 29.10%). While shelling and grading was done jointly with both male and female members of the family. Majority of the respondents (93.80%) did not participate in marketing agriculture produce.

Sulakshna et al. (2007) has carried out the research to find out the extent of involvement farmwomen in agricultural activities in Kurukshetra District. The study has revealed that maximum involvement of farmwomen was in harvesting (97%) followed by threshing, weeding (85%), storage and transplanting. The farm women had low involvement in activities like irrigation, sowing and seed treatment.

Women play an important role in agriculture production. They perform many activities. Involvement of women in certain activities like crop production is very high. In dairy they play active role, in spite of all these they have not been given due recognition as compared to their counterparts.
2.3 ECO-FRIENDLY AGRICULTURAL APPROACH

Rajkumar (1981) reported that, majority of the farm women respondents (82.50%) had medium level of adoption of water management practices. About one tenth (10.83%) had low level of adoption and those with high level of adoption were found to be very low.

Ganesan (1982) found that majority of the farmers have adopted the Natural Resource Management (NRM) practices such as synchronized planting, sowing/planting in correct season and adopting crop rotation to prevent pest attack in paddy.

Pillai (1983) reported that about 50 per cent of the farmers were in the low gap category and adopted any two or more practices in integrated soil conservation. One third belonged to the medium gap category indicating that they had adopted one or two major practices.

Jayaraman (1988) observed that 80 per cent of the paddy growers were found to be medium level adopters while 20 per cent of them were low-level adopters. There were none in the high adopter category with respect to the practice of neem cake treated urea application to nursery.

Majority of the paddy growers (53.34%) were medium in their overall adoption of recommended water management practices followed by 26.66 per cent in low level and 20 per cent in high level adopter category as reported by Suresh (1991).

Dailla (1994) conducted a study on the adoption of soil conservation practices in the two rural communities at Burkino Faso. He reported that the level of utilization of manuring and stone lining was between 96.70 and 100 per cent in the two rural communities.
Ponkathaperumal (1994) studied the adoption of Integrated Nutrient Management practices by farmers in paddy. He found that the practices Viz., application of farmyard manure to nursery, application of farmyard manure to main field, application of neem cake treated urea, application of azospirillum were adopted by more than two third of the farmers.

According to Ponnusamy et al (1994) more than three fourth of the target group farmers adopted majority of the integrated farming systems (IFS) technologies.

Karthikeyan (1995) found that the farmers who had been confronted with various problems related to water sources, particularly ground water, maneuvered those problems by following some adaptive strategies Viz., decreasing the cropping intensity (80.00%), decreasing the frequency of irrigation (80.00%), changing cropping pattern (70.00%), adopting short duration varieties (66.66%), reducing the land area for cultivation (26.66%), adopting high yielding varieties to combat the yield reduction problems (10.33%) and adopting drip irrigation technology (3.33%).

Muthuraman (1995) concluded that nearly 40 per cent of the rice farmers were medium adopters and 30 per cent of the farmers belonged to each of the other low and high adopter category of organic manures. In the high adopter category only 16 per cent of the farmers followed green manuring. They preferred sunhemp or sesbania (Dahincha) as a pre kharif green manure crop. Nandini (1995) reported that earthern bunds were made to conserve soil and moisture by the farmers in the study area. This was reported by seventy per cent of the respondents. Cultivation of cover crops is another indigenous practice followed by the farmers (41.67%) to conserve soil and moisture. For the same purpose about 90 per cent of the farmers had gone for intercropping practices. She further reported that all the farmers practiced summer ploughing. Around 70 per cent of the farmers
applied organic manure to soil to nourish the soil and improve the soil structure and fertility status. Lantana camara and agave were also planted near the bunds to combat erosion and conserve soil and moisture.

Venkataramani (1995) found that the adoption of ecological farming is not as simple as one presumes. It is a highly knowledge intensive, labour oriented and complex system integrating several organic recycling processes. A high degree of motivation, a firm commitment and conviction and innovative ability made successful organic farmers. He also stated that the agricultural practices that were governed by the principles of ecology and were within the ecological means were put to practice by some enterprising farmers an agricultural technologists and their experience showed that this type of natural farming provided an excellent illustration of sustainable agriculture. He opined that the adoption of an integrated package of ecological farming system was the holistic approach to sustainable agriculture.

Prasad and Rao (1997) found that the peasants of Ranapuram village of Anantapur district had gone for cultivating groundnut to cope up with the drought and famine as groundnut proved to be drought resistant crop compared to ragi, korra and bajra. To cope with erratic rainfall they also cultivated crops with different maturation periods in a rotation. Since fire wood had become scare in the village, poor people made it a point to go for at least two or three weeks work to nearby place for cotton picking. By this way they earned little money during slack season and another as seasonal labourers to carry the cotton stalks to their village to use it as fuel.

Khatik (1999) found that most of the farmers adopted contour farming and intercropping as soil and water conservation practices. The other important practices were green manuring and summer ploughing. The least adopted soil and water conservation
technologies were mulching, strip cropping and grass waterways. About one third of the farmers had adopted the practices like levelling (34.66%), ridges and furrows (24.00%) and live vegetative barrier (38.66%).

Shivalingaiah and Srikanth. (2001) reported that around four fifth of the coconut farmers have adopted the NRM practices namely recommended number of seedlings per acre, recommended spacing and pit size. The correct irrigation schedule was followed by 60 per cent of the farmers.

Gupta (2002) indicated that runoff from the sloppy lands was a serious problem of water and soil fertility loss in the Kalayanpur (District: Barmer) of Kerala. Efforts have been made to intercept it by bunding and vegetative barriers. Bunding of 30 to 40 cm height at 3 to 5 m interval with vegetative barriers of Lasiurus sindicus / Cencrus ciliaris intercepted runoff, improved the profile soil moisture storage and productivity of Moong (S-8) and Moth (RMO-40) by 40 to 50 per cent over control without bunding at farmers fields.

Seema Jasiya and Khan (2007) based on their research, recommended that traditional agricultural practices (such as summer ploughing, seed treatment practices namely, dipping of bajra seeds in 20% salt solution for five minutes to get Ergot free seeds and rubbing of cotton seeds with cowdung for easy dibbling and better germination) having scientific rationality should be popularized among farm women by organizing demonstrations and field visits which ultimately enhance their extent of utilization.
2.4 SUSTAINABLE AGRICULTURE

Generally, it is not possible to define sustainable agriculture in terms of specific set of practices. A sustainable agriculture must be capable of continually evolving, while preserving the social and natural resources upon which it is based (Alteri, 1986).

For sustainable agriculture (Granatstein, 1988) suggested use of other terms such as ‘natural’, ‘ecological’, ‘biological’, ‘alternative’, ‘low input’ and ‘regenerative’ in contrast to ‘high input’, ‘maximum production’ and ‘intensive agriculture’.

Sustainable agriculture as an integrated system of agriculture production that is less dependent on high inputs of energy and synthetic chemicals and more dependent on intensive management rather than conventional monoculture systems (Edwards, 1987).

According to Ruttan (1989) definition of sustainability should include (a) development of technology and practices that maintain and / or enhance the quality of land and water resources and (b) improvement in plants and animals and advances in production practices that will facilitate substitution of biological technology for chemical technology.

Conway et al. (1991) opined that sustainability implies to less specialized farming, often requiring mixed crop / livestock farming for less dependence upon outside inputs, whereas adequate environmental protection with the intervention of issues.

Hess (1991) explains the term ‘sustainable agriculture’ as the use of the very best technology in a balanced, well managed and environmentally responsible system. It relies on skilled management, scientific know how and on farm activities.

The sustainable / low input agriculture has two criteria that agriculture should lower than costs and reduce negative impacts on soil and water resources. Thus, three
broad areas of concern that seem to underline the concept of sustainable agriculture as proposed by Ray (1990) are: economic concerns, environmental concerns and public welfare concerns.

Sustainable production system should be directed towards three essential goals namely (1) food security, (2) employment (3) income generation, (4) natural resources conservation and environmental protection (Pookpakdi, 1993).

No single agricultural method has a corner on sustainability. Any farming system whether chemical intensive or natural can be in some aspects resource - conserving and in other aspects wasteful, environmentally unsound or polluting. Simply substituting non-chemical alternatives may not necessarily made agriculture more sustainable (Dover and Talbot, 1987).

According to Hoods and Gupta (1995) most agreed definition of sustainable agriculture is “the appropriate use of crop and livestock system and the agriculture inputs supporting their activities which maintain economic and social viability while preserving the high productivity and quality of the land”.

The means to achieve greater agricultural sustainability are (1) biological diversity (2) crop rotations (3) animal integration (4) the soil as biological system (5) Knowledge based farming, (6) human scale farm size and (7) minimal dependence on non renewable resources (Ray, 1990).

Edwards (1988) highlights the importance of fully integrating various practices for maximizing benefits in sustainable agricultural systems; legume rotations; use of organic, animal and agricultural wastes; integrated pest management, pest and disease forecasting; biological and cultural pest control; live mulches and mechanical weed control;
conservation tillage and specialized innovative cultural techniques such as intercropping, strip cropping, trap crops and double row cropping.

Some of the manipulability components for attaining sustainability are: (a) improved cultivars and cropping systems, (b) conserving tillage and crop residue management; (c) application of fertilizers and organic amendments and (d) water management (Lal and Miller, 1990).

Swaminathan (1989) opined that prevention of soil erosion, conservation and management of water resources, conservation of biological diversity using in situ, ex-situ, in-vitro and in-vivo methods and promoting the spread and development of economically viable and ecological sound farm techniques which are the main components of a sustainable agricultural system.

The indigenous crops and plants yield more with fewer inputs. Conservation of rain water could be done by contour bunding, reduction of evaporation by growing trees, wind breaks, ground cover and mulch and drip irrigation. Green leaf manure, wastes from coconut husk, organic waste along with occasional spraying of diluted cow's urine were found to be more effective. Planting of votive grass on the bunds, use of uprooted weeds for mulching and use of biogas slurry in composting were also identified as the most cost effective technologies in conserving natural resources (Erik, 1990).

Organic farming is a system of agriculture that encourages soils and crops through such practices as nutrient recycling of organic matter (such as compost and crop residues) crop rotations, proper tillage and the avoidance of synthetic fertilizers and pesticides application (Anon, 1996).

According to Baldwin (1991) vermi-composting as the process of using earthworms and microorganisms to convert organic waste such as manure or household
refuse to valuable compost. Earthworms help the farmers by decomposing organic matter, generating nutrient rich crust and opening channels in the soil thus, improving soil fertility and structure.

Khosla and Sunil (1991) explained that agro-forestry is a sustainable land use system that maintains or increases total yield by combining food (annual) crops with tree (perennial) crops and / or livestock on the same unit of land either alternating or at the same time using management practices that suits the social and cultural characteristics of the society and the economic and ecological conditions of the area.

Elongovan and Vasanthakumar (1997) identified eco friendly technologies for Tamil Nadu state are (1) biofertilizer application, (2) green manuring, (3) vermicompost, (4) enriched farm yard manure (5) compost application (6) coir pith compost, (7) neem cake application, (8) IPM, (9) seed treatment with trichoderma, (10) afforestis ration, (11) nitrogen-fixing trees, (12) Neem seed kernel extract, (13) agro-forestry, (14) integrated farming system and (15) rice fish azolla culture.

2.5 SUSTAINABLE AGRICULTURAL PRACTICES PERFORMED BY THE WOMEN FARMERS

Prakash and Pushpa (1996) studied the use of improved farm implements by rural women in Rajasthan. Two implements, i.e., seed cum fertilizer drill and serrated sickle were being used frequently by farm women. The study concluded that there is a need to plan and execute specialized training programme for farm women in the field of farm implements so that the farm women can learn and develop confidence in using them and thereby increasing agriculture production.

Khatik (1999) in his study on the adoption of soil and water conservation technologies found that majority of the farmers adopted contour farming practices in Navamota watershed located in Khedbrahmma taluka of Sabarkantha district in Gujarat.
The second most popular soil and water conservation practice was intercropping adopted by 88 per cent of farmers. The other important vegetative practices were green manuring and summer ploughing.

Studies of BAIF carried out in semiarid areas of north Gujarat and west Rajasthan indicated that livestock contributes 45 to 52 per cent of family income. It is the women who look after livestock and backyard poultry and thus play a major role in sustainable production and food security for the family, through optimal use of local resources (source: Internet).

Tamilselvi et al. (1999) conducted a study on the role performance of farmwomen. Wet land-farming system of Tirunelveli district and dry land farming system of Tuticorin district were selected purposively for the study. The results indicated that summer ploughing was performed through supervision and reminding by dryland farmwomen. The data further revealed that preserving inputs was carried out by large majority of farm women in both the areas by self doing while measuring the seeds for sowing was carried out by large majority in wetland farms through supervision of labour and by a substantial percentage in dry land farming situations. Seed treatment with chemicals and with biofertilizers was carried out by self-doing by 6 and 1.67 per cent of the wetland women farmers respectively.

Women throughout the west are up to three times more likely to be the operator of a farm in sustainable agricultural models than in productivity models. When women assume the role of farmer they transgress traditional gender identities on farms, which dictate that women are ‘farmwives’ and men are ‘farmers’; these gender identities intersect with spaces in the agricultural community to imply appropriate behavior for women as farmwives. The sustainable agriculture community provides spaces that
promote and are compatible with women’s identities as farmers. Feminist analyses of space and agriculture suggest that productivity agricultural models marginalize women from spaces of empowerment for women farmers (Anon., 2004).

Lalitha and Narayana Swamy (2007) stated the results of the study showed that women have been playing a greater role in ancient, medieval and modern periods of the history in management of natural resources in rural India. They are of the opinion that women need to be empowered for management of technically sound, economically viable, environmentally non-degradable natural management technologies in rural India.

Bharathamma et al. (2007) carried out research on empowerment of women for natural resource management. The findings of their study revealed that economic independence or access to an inherited or self-generated income is considered as an important asset for women and this strategy is attempted and advocated by many governments in third world countries. The social and economic development helps for better participation and decision making in soil and water management programmes. Further they have stated that there is a need to enhance women access to legal literary and information and provide equal opportunity for equal participation in developmental process.

Vishwanth Hiremath et al. (2007) studied on the knowledge of ecofriendly technologies for agriculture, their study revealed that majority of the vegetable growers had high to low-level knowledge in ecofriendly technologies. More than 90 per cent have knowledge about deep ploughing during summer growing marigold as a trap crop, crop rotation, collecting and destruction of affected plant parts and shoots and use of neem seed kernel extract in tomato crop (82%) and neem cake in cabbage crop (73%). Majority of the farmers did not follow the use of pheromone trap and light trap.
Jaganathan et al. (2007) stated that as a result of modernization of agriculture, the cost of inputs is high and they are not accessible for small and marginal farmers. They are of the opinion that sustainable agriculture is the need of the hour to make the agriculture viable in all respects. Sustainable agriculture is a set of farming practices that 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 crops, better plant protection, postproduction management for value addition and marketing.

2.6 TRAINING NEEDS OF WOMEN FARMERS IN SUSTAINABLE AGRICULTURE ACTIVITIES

Participatory training suggested by Ellis (1987) is one of the best methods to get full participation of women in the development process. The participatory approach in training is based on the belief that adult learn more effectively when they are involved in activities that take the knowledge and experience into account, to meet their needs and help to derive satisfaction.

Considering women’s involvement in a wide range of agricultural activities, it is evident that production potential can be realized only if women get the necessary training, technical know how and support. India’s socio-economic growth depends greatly on the extent of improved technology applied in agricultural production (Venugopalan, 1992).

Proper training of women in improved and modern technique of the farm operations will go a long way in improving the skill of women and thereby increasing the farm productivity (Anon., 1995).

Shilaja and Jayaramiah (1992) studied the training needs of farm women in Kannur and Kollam districts from the north and south zone of Kerala, since these two districts
were found to have the highest rural women population as per 1981 census. The response of farmwomen was obtained on a four point continuous ranging viz., 'most needed', 'and needed', 'somewhat needed' and 'not needed'. Identification and treatment against common pests and diseases, time and method of fertilizer application, optimum plant population, fertilizer requirement of different crops and kitchen gardening obtained higher mean index scores; whereas, transplanting seedlings in the main field, technique of preserving healthy seeds and economic planning and budgeting obtained lower mean index scores. The study necessitated the need for training on the latest technological advances to help them to improve their training skill and maximize production and improve their income.

Bhople and Patki (1992) in their study on the correlated of role performance and training needs of farm women labour stated that plant protection, threshing and grain storage were the first three areas in which farm women labourers required training. They also mentioned that the farm women should be equipped with technical skill in handling and use of various tools, appliances and machineries like sprayers, dusters, threshers and winnowers. The improved techniques in storage of farm produce and grains and their marketing may also be imparted by organizing training programmes for them. They opined that by this it will save manual labour and increase the efficiency of farm women labourers. Their study concluded that, to involve farm women labourers in skilled jobs in farming like plant protection, threshing and grain storage and marketing, the skill training needs to be imparted to them, by this; it will increase their efficiency as well as income.

Sailaja and Narasimha (1997) studied the training needs of farmwomen in groundnut in Andhra Pradesh. Two sets of samples were drawn for the study. One set consisted of wives of small and marginal farmers and the other set comprised of the trainers of three Farmers' training centers in the concerned districts. The commonly and
greatly preferred training needs in knowledge in groundnut in the study area as perceived by farm women were cropping system and rotation, varieties, soil and moisture conservation and reclamation while that of trainers was seeds and sowing and plant protection. The study concluded that it was high time for planner, policy makers and extension personnel to think of immense potential of women in agriculture available and develop appropriate strategies for increasing the competency and capabilities of farmwomen and orient them towards the right perspective to achieve sustainability in agriculture and allied fields.

Jondhale and Bhele (1998) conducted a study on the training needs of farmwomen in Krishi Vigyan Kendra. The investigation was carried out on the selected operational area of KVK, Aurangabad district of Maharashtra state. Forty-seven activities were selected and respondents were asked for their opinion about which training activity they felt as highly needed, needed and not needed for training. In respect of farm women, the data revealed that, vermiculture was the highly important training needs assigned as first by all the respondents, whereas solar cooker was the second training need assigned by 80 per cent as highly important training need and gobor gas and smokeless Chula were found to be third training need assigned by 73.33 per cent of respondents as the highly important training need. Further, the data showed that seed treatment was the first need of training assigned by 93.33 per cent respondents, followed by winnowing of the harvested crop was assigned as second need by 92 per cent. However, feeding the cattle and taking animal for grazing were found to be third training need assigned by 86.66 per cent respondents. Cleaning the grain was not needed to have training assigned by 69.33 per cent respondents and to weed the crop was found to be third not needed assigned by 65.33 per cent respondents.
Meena and Intodia (1999) presented a paper on the women's empowerment for sustainable agriculture development. They opined that, training was an important component of HRD, which enhances knowledge, skill and attitude. For building technical competency among the farmwomen, specialized need based and skill oriented training should be organized preferably at the village level. Some of the priority areas in which women need training are- conservation and management of natural resource, Integrated Pest Management and Integrated Nutrient Management, renewable energy source, seed production technology, use of fertilizer and post-harvest management.

Singh et al. (1999) studied the relevance of selected development programmes for rural women in Hissar and Gurgaon districts of Haryana and Najafgarh block of Delhi. The results indicated that most of the rural women needed training in animal husbandry (40.83%). Next in demand were training in the area of food preservation (32.50%), Sowing (32.50%) and vegetable nurseries (30.00%). These areas were followed by need for training in wheat production (30.60%), fodder crops (22.50%) and cotton (20.85%). The study concluded that rural women constituted an important work force in agriculture. In order to make the development programs more relevant and effective the trainings have to match the needs of women assessed through participatory approach.

Beena and Chaudhari (2000) studied the training needs of farm women in modernizing agriculture. The study was carried out in 15 randomly selected villages of Nagpur Panchayat Samiti. A total of 150 respondent women were selected randomly. The results indicated that the area in which the respondents needed training mostly and which ranked first was seed treatment, second aspect, which needed training, was use of improved seed. Drip irrigation was considered the third most important training required by the farmwomen. However, training on use of biological pest control, sprinkler irrigation and use of biofertilizers were not essential to the farm women, as per the study.
The study concluded that the training need in the modern practices of agriculture increased with the increase in socio-economic status because farmwomen having more socio-economic status are more aware of the modern practices and hence were more interested in receiving training.

Desai et al (2000) studied the involvement of rural girls in agriculture and assessing their training needs. The results revealed that the area in which the respondents needed training most and which ranked first was processing of farm produce i.e., preparation of different products from agricultural produce. Other area in which training was perceived as 'most needed' by the respondents were in descending order- sowing, plant protection and harvesting, whereas in area like storage of farm produce, interculturing like weeding, preparatory tillage operations, use of manures and fertilizers, water management and use of agricultural implements were perceived as 'just needed' training needs by the rural girls.

Amtul et al (2002) studied the technological needs of farmwomen in Mahboobnagar district in Andhra Pradesh. Using the Rank Based Quotient (R.B.Q) identified technological needs of farmwomen. The results indicated that the farmwomen required training on knowledge of varieties that are tolerant to drought, knowledge and skill of seed treatment, sowing, mechanical harvesters and storage techniques. The study concluded that the extension needs as perceived by farm women of the study area, necessitate need for training programmes to impart both knowledge and skill to farm women.

Dhriti and Intodia ((2002) made an in-depth assessment of knowledge of the farmwomen in different components and identified the areas for technological empowerment of women. Seed treatment, soil testing, treatment of saline soil, chemical
weed control, plant protection measures, concept of nutrition garden, plant propagation techniques, silage making, concentrate preparation and use of mineral mixtures for animals were the various fields in which the farm women required training. The study concluded that 'women in agriculture' scheme has made significant contribution in improving knowledge of the women in crop production, horticulture and animal husbandry aspects however still there exists a wide technological gap in all these areas. Hence, intensive efforts are needed for promoting technological empowerment of farmwomen.

Meenu et al. (2002) conducted a study on the technological empowerment of farmwomen in dyeing and printing with indigenous dye sources. Looking into the commercial aspects of colouring capacity of brightly coloured plant products for value addition products. Technology empowerment of rural women is very essential in the field of dyeing and printing with natural dyes. The rural farmwoman performs multifarious activities. Besides managing family her economic role is in fact, an extension of her welfare role. By adhering to domestic obligations and shouldering modern role as income earner, she would have done better in the economics of the family, If she could have been trained with new technologies in the field of dyeing and printing through appropriate intervention packages.

Meera et al. (2002) conducted a study in Mural block of Muzaffarpur district of Bihar to know the training needs of women in agriculture. To ascertain the training needs of rural women in major areas of agriculture allied and household activities, specific list of items in each area were prepared. The findings revealed that the farm women perceived high level of training needs in handling of labour saving implements, followed by pest and disease management and fertilizer application. Further, selection of crop varieties, storage and marketing, transplanting and weed management received low scores, indicating that
the farm women did not require any training in these areas. The study concluded that there was a need to make provision of appropriate training for the rural women to enable them to gain the needed knowledge and acquire skills.

Farinde and Ajayi (2005) studied the training needs of women farmers in livestock production in Nigeria. The study was conducted in Oyo State, Nigeria. Five local government areas (LGAs) were purposively selected to ensure good coverage of the state and inclusion of local government areas having more rural communities. A total of 171 women farmers were interviewed using random sampling method. They opined that, it is possible that women farmers may have the desire to raise animals due to income that can be generated from such activities. The women were willing to be trained in all the relevant operations irrespective of their knowledge and skill possessed. They concluded that women farmers have training needs which should be met in the course of development programmes directed both of them and the rural populace. They recommended that agricultural extension agent should be encouraged to train women farmers on the improved livestock and poultry management strategies.

Vishwanath Hiremat et al. (2007) based on research findings stated that majority of the farmers (85.8%) had expressed that there is need for training on biological pest management followed by preparation and use of biopesticide (77.5%) seed treatment with bioagents (76.7%). Majority of the respondents had expressed the problems like lack of technical knowledge and guidance (89.2%) high cost of eco-farming inputs (85.0%), non-availability eco-farming inputs like bio-fertilizers and bio-pesticides (83.3%).

Asokhan et al. (2007) Studies the training needs of rural women possessing cultivable land membership in self-help groups in Tamil Nadu. More than half (52.66%) of the members required training on general agriculture followed by
general cattle management (46.33%) and dairy management (45.66%). They wanted to know the cost effective latest technologies to be adopted in their farm for getting more income. Majority of the members (49%) preferred training programmes at their village itself followed by NGOs premises (23.33%) and KVKs (20.66%).

Srinivasalu Reddi et al. (2007) stated that development has no meaning without the development of women and often it is said, "Women development is nation's development". Even though women participate in each and every operation in agriculture, they were ignored for long time. Now, it has been realized and many training programmes are organized to impart knowledge and skills. Women when trained they do better in their activity. Based on the results on the impact of trainings, they found that majority of the trained farm women (41.67%) had high level of knowledge, while 46.67 per cent of untrained farm women fell under low knowledge group and difference in knowledge levels between trained and untrained farm women was highly significant. Further they have stated that adoption of the practices was more by (55%) trained farm women and they were able to take part in decision-making.

2.7 ECONOMIC CONTRIBUTION THROUGH AGRICULTURE BY THE WOMEN FARMERS

Gill et al. (2002) conducted a study on participation of women in agricultural and allied activities. The zone-wise economic contribution made by the farm women from agricultural and allied activities were studied. The results showed that majority of them, (51.67 per cent) from all the zones contributed Rs. 100-500 per month from agricultural activities followed by 40.83 per cent, who contributed Rs. 501-1000. There were only 7.50
per cent women who contributed Rs. 1001-1500 per month. As regards the allied activities, there were 45.00 per cent women who contributed Rs. 501-1000 per month from allied activities. There were 45.00 per cent of them who did not contribute any income from allied activities.

Alibi et al. (2006) analyzed the factors enhancing effective financial management of rural women in Osun state, Nigeria. A total of 180 women were selected for the interview. The results of the study indicated that most of the respondents (71.7%) used their income immediately realized to buy their personal and household needed articles. A Principal Component Analysis was carried out to know the factors enhancing effective financial management. The most crucial factors with higher values were considered and retained in the analysis. The factors retained were named based on the variables that loaded highest on each factor and the similarity of the features of the variables contributing to the factors. The five factors extracted were: need satisfaction, community influence, financial security, economic independence and occupational influence. The study recommended that, it was not enough to know how to generate money, but also how to manage the money generated effectively, hence financial management training should be organized for rural women to enhance their money management skills.

The studies so far conducted under various agro climatic situations have indicated that there is a need for training programmes for women farmers engaged in sustainable agriculture activities. The training programmes need to be organized based on the specific needs of the women farmer. As more and more women especially under rural conditions getting involved in farm activities including farm management, suitable training programmes at suitable situations would help in confidences building in sustainable agriculture, high productivity and improving family economy.