

CHAPTER 1

INTRODUCTION

1.1 Introduction

Since the advent of human civilization, women have played a pivotal role in case of characterizing and giving impetus to the growth and development of agriculture as a vocation. Women have their inclination towards doing the household activities from the primitive era. Women have their efficiency in case of dealing the complex things in a multidimensional social situation. Till date, women are the critical workforce for the development of our economy and society. As per Census, 2011, 48.46% women of this country are generally associated with the sustainable domestic activities and considerable sectors of women are involved to the wellbeing of farm households. Women are involved in all aspects of agriculture and allied activities from land preparation to making agricultural produces. Nowadays 44% world's food is produced by women which shows the importance of women in agricultural sector (Chowdhury, 2008). Rural Indian women are widely involved in agricultural activities. However, the nature and level of their participation differs with the variations in agro-production systems. The form of female participation in agricultural production varies with the land-owning status of farm households. Their role ranges from managers to landless labourers. In overall farm production, women's average contribution in India is estimated at 55% to 66% of the total labour with percentages much higher in certain regions (Venkateswan, 1992). Indian women in contemporary India do not enjoy an equal status with men, as Indian society has strong overtones of patriarchy. The social status of farm women reveals that most of them belong to socially backward and economically disadvantaged groups like Scheduled Castes, Scheduled Tribes and backward classes. So, women are the backbone of the village economy in general and of the economy of agriculturally dependent districts. Thus, farm women's role is biological and social combined to create four distinct functions of mother, wife, homemaker and worker. The role of homemaker and worker is equally important as the two roles. But her role as an active worker and producer is rarely acknowledged though it is significant for the family's survival (Reddy, 2003). Status and role of Indian women and their problems are linked to the history and social system of the country. They are not treated at par with men in many aspects of life. Though six decades have passed since independence, women are yet in the grip of the traditional role resulting into the economic dependence, social neglect and political ignorance, eventually preventing them to attain their due place in society. Female children as unpaid contributors have considerable role in household production. They contribute substantially as helpers in subsistence farming, livestock management, gathering fuel wood,

collecting water and acting as surrogate mother when the mother is busy in farm and other livelihood activities. By virtue of these various activities, they qualify as essential components of rural labour force. But their contribution is ignored by standard estimates of labour force. Recently many households in rural areas are headed by a single parent usually a mother because male migrate with their limited literacy and skill to urban area for secondary jobs leaving the illiterate women behind with the land and children leading to *feminization of agriculture*. These women despite the fact that they are performing several farm activities, their roles have been overlooked by agriculturalist and policy makers. Although the decision to be taken by farm women is influenced by the opinion of others with whom they interact (Chaudhary *et al.* 1998). Women's decision-making freedom is linked to whether she is engaged in gainful economic activities or not. Her economic activity and economic contribution help women to gain more power in making decision. Farm women are not much acquainted in new agricultural technologies and other innovations. Today, farm women do not seem to have meaningful access to the new farm technologies as they have little access to non-formal education, rural institutions and extension services.

Despite significant contributions of women in the crop production, animal husbandry, fisheries, forestry and post-harvest operations, those engaged in the formulation of policies have often tended to neglect the productive role of women. But still the role of women is marginalized, undervalued and unrecognized. Women's status in society is measured in terms of educational level, income, employment as well as the role played by them in the family, society and the community. Education affects employment opportunities and the decision-making role. Economic viability and education contribute either singly or jointly to women's empowerment. In fact, education and employment of women are the first prerequisite not only for improving the status of women but also for moving towards gender equality. In production relations gender relation takes the form of the appropriation of women's household work. In labour market it takes the form of discrimination in wages, sexual segregation of jobs, restricted entry to jobs, inadequate access, ownership and control of productive resources like technology, skills, education, productive assets like land and credit, information and mobility. State agencies are usually dominated by men and are, therefore, biased towards patriarchy either because of their male interests or simply ignorance or poor understanding. Women are poorly represented in these structures to make a difference. There is a tendency among the administrators and policy makers to see men as farmers and women as farmer's wife and highlight their supportive roles rather than productive roles (Samanta, 1994). As a consequence,

the biasness of the development planners in agricultural planning process is enumerated as follows.

- Women are consumers of social services, rather than producers and hence, it is enough to reach them with schemes like applied nutrition, home making, tailoring, weaving, pre and postnatal care etc. Agriculture is not their forte.
- Within the family structure, there is 'inside-outside' dichotomy in respect of division of labour. Agriculture is perceived as an activity, with its local outside the house and hence, women are left out.
- Whatever women do in agriculture, are usually auxiliary in nature and hence they need not be brought into the purview of agricultural development.

In such a resilient research climate there is a need to reemphasize the role of farm women in household activities, livestock rearing and farm activities and in decision making process. Thus, there is need for a conceptual and theoretical framework that can fully explicate the relationship of women's involvement in agricultural decision-making process. Keeping all this in view, the present study is conducted to explore the areas of women's involvement and decision making in agriculture and allied activities.

1.2 Review of Literature

A comprehensive and systemic review of the past literature is a prerequisite for carrying out any research in a scientific manner. A reference to the past studies provides guidelines not only to frame future areas of research to be covered and methodology to be adopted but also to confirm or repudiate research outcome with possible reasons.

Chaudhary et al., (1998) revealed that age, education, cosmopolitans, mass media exposure and extension contact were positively related with decision making ability of farm women in relation to farm and aspects, while income and socio-economic status were found to be non-significant in relation with decision-making. It has clearly indicated that educated women, having contacts outside their social system, having more mass media exposure and better extensive contacts influenced the decision-making. It also indicated that farmwomen who had higher income and higher socio-economic status took independent decisions.

Punam Kumari (1998) opined that 50% of the societies population who contributed significantly in making their homes were not given due share in decision making, pertaining the economic affairs of the home. The study rather showed that men were taking all the major

decisions in the households. The study further revealed that the joint decision-making was also adopted in less than 25% of the cases showing male dominance in decision making in various areas.

The extent on involvement of women in farm operations like the selection of seeds including hulling and inter-cultivation, sowing activities, harvest and post-harvest activities respondents showed medium levels of involvement. (Saikia and Das, 1998).

Doss R. (1999), stated that based on an extensive review of the literature on women farmers in Africa, this paper explored the potential reasons why women farmers had not adopted improved maize technologies and discusses the implications for agricultural research. Women farmers were often constrained by their lack of access to labour, land, and inputs. In addition, women may prefer different outputs than men. Finally, the dynamics of household decision-making affects technology adoption; roles and responsibilities within the household were often renegotiated when new technologies were adopted, and women may be reluctant to provide labour if they did not receive some of the benefits. Each section of this paper includes a number of questions that may provide insights into the gender roles and dynamics in a particular community. Three general conclusions could be drawn from the available literature. First, there was enormous complexity and heterogeneity among African households. Second, there was no simple way to summarize gender roles within African households and communities. Third, gender roles and responsibilities were dynamic; in particular, they change with new economic circumstances. An extensive annotated bibliography on gender issues and the adoption of maize technologies in Africa follows the review of studies.

A study by Antoniadou et al., (2000), analyses the position of rural women in the mountain region of Cyprus. It examined their personal and family characteristics and their attitudes towards on-farm employment. It also investigates their role in the farm household, their perception of public participation and their stance to new roles that were emerging for rural females as a result of social change. Women in the zone were aged, with 44% being over 63 years old. The vast majority (82.9%) was at the same time housewives and farmers and only 13% were fully or partially employed in 'off-farm' jobs. Younger women had a higher incidence of 'off-farm' jobs mainly due to higher level of education and improved opportunities to choose their own employment status. With regard to vocational agricultural education, 3 out of 10 attended training courses. In addition to domestic work and childcare, women were involved in farm operations. Involvement in farm administration was extremely low. Participation in decision making for farm and household day-to-day operations was high but

decisions relating to household improvements or on-farm investment continue to be the domain for men. Some 40% shared responsibility with men in the management of the farm budget. Public participation was relatively high, with 60% being members of local organizations from mainly local cooperatives.

Fuah, (2000) showed that the major factors influencing participation was family income, level of formal education, age, family size, the numbers of animal kept and average land available for cropping activities. In general, despite of the significant roles of women in agricultural production and regional development, their participation was hardly recognized. The need to support rural women's role in agricultural development was stressed.

Alesina et. al, (2001), said that the historic origins of current differences in norms and beliefs about the appropriate role of women in society. They tested the hypothesis that traditional agricultural practices influenced the historic gender division of labour and the evolution and persistence of gender norms. They found that, consistent with existing hypotheses, the descendants of pre-industrial societies that practiced plough agriculture, today have lower rates of female participation in the work place, in politics, and in entrepreneurial activities, as well as attitudes reflecting gender inequality. The causal impact of traditional plough use on gender norms today by exploiting variation in the historic geo-climatic suitability of the environment for growing crops that differentially benefited from the adoption of the plough. To isolate the importance of cultural transmission as a mechanism, they examined female labour force participation of second-generation immigrants living within the society.

The study conducted by Suradkar and Nirban (2001) reported that personal characteristics of farm women like education, marital status, family type, farming experiences and mass media exposure were affecting the extent of participation of farm women in decision making.

Devi et al., (2002) opined that a larger percentage of the rural women took decision jointly and hence a medium level of involvement in decision-making was found. There was no relationship between involvement in decision-making and selected independent variables but educational facilities to female should provide to broaden their mental horizon, which will ultimately enhance their participation in decision-making.

Joint decisions were predominant (26%) in the medium category, which showed that there was mutual understanding between husband and wife. There was close association between wife, husband and both regarding decisions making in family activities. Husband

decision in farming activity was in higher proportion (3 to 45%) in all the categories. Joint decisions were more in farm aspect as compared to home activities (17 to 44%). The extent of decisions taken jointly by husband and wife were found to reduce (8.50%) in case of Artisan category along with corresponding increase in the decisions taken by husband alone. (Kamble et. al., 2002).

Sarkar et al., (2002), opined that education, information use, level of aspiration, management orientation in enterprise and decisiveness in financial affairs had significant bearings on the level of participation in fish farming enterprise.

A case study by Swarnalata et al., (2002), revealed that the contribution of female labour in crop and livestock activities was higher than that of male labour before as well as after project implementation. Despite such a high labour contribution, females were dependent on their male counterparts for technical advice. There were certain farm decisions, like choice of crops to be grown, quantity of grain to be marketed, and soil and water conservation methods, in which more than 60% of the women were consulted.

Chhaya Badiger et al., (2004) reported that the nature and extent of women in agriculture and animal husbandry activities vary greatly from region to region and even within a region. It varies widely among different farming system and socio-economic status of families. In agriculture, operations in respect to the amount of work, maximum numbers of women were participating in cleaning of the grains, fertilizer application, gap filling, transplanting, sowing, grazing, nursery, seedling, picking, drying etc. In animal husbandry operations, major amount of work done by farm women were cutting, collection and making bundles of fodder, feeding of animals, cleaning of cattle shed, collection and disposal of dung, feeding of colostrum to the calves, boiling of milk and churning of milk.

On the basis of the study in Uttar Pradesh, Das (2004) observed that rural women participated in all kinds of agricultural activities. Same way 96% women were involved in animal husbandry activities. As far as participation of rural women in decision making in matters related to agricultural operation and family affairs was concerned, 98% women were consulted in marriage of their children, but only 32% women were consulted in money matters, though a higher percentage of women were consulted in selection of seed, storage and selling of farm products.

The extent of farm women's contribution can be guessed from the finding in a study in the Himalayan region, where a pair of bullocks works 1064 hours, a man 1212 hours and a woman 3485 hours a year on a one-hectare farm (Grover & Grover, 2004).

Sarkar and Pradhan (2004) identified three very important variables viz. age, education and family size of the respondents which had effects on women participation, planning and decision-making process.

Singh et al., (2004) observed that the average employment for female workers, per hectare basis was higher (190.60 days) than male workers (168.40) in crop production as whole. The rate of participation of female workers was higher than male workers in certain crop operations like sowing, inter-culture, harvesting and threshing. In production of all crops in the study, the participation of male workers shared for 261 days and female workers 238 days.

Bhagowalia P., et al., (2007), contained most developing countries strive to improve agricultural productivity by relaxing credit constraints, supplying better inputs, and improving marketing and distribution. However, the efficacy of these reforms needs to be examined in the context of the behavioural responses of farming households. They examine gender biases within households that affect short term decisions with immediate and long-term implications. They utilize data from ICRISAT's village level studied in India (1975-85) to highlight the effects of child gender on the use of agricultural inputs. The main finding was that households with boys tend to use purchased inputs such as fertilizers and insecticides more intensively compared with households with girls. In general, household with boys also tend to have larger land holdings, and use animal and human labour to a greater extent than household with girls.

Kaur et al., (2007), said that empowerment was an active process, which enables women to realize their identity and power in all aspects of life. It enables women to have more access to knowledge and resources, greater autonomy in decision making, greater ability to plan their times, free them from the clutches of irrelevant customs built and practices. The study was conducted in one of the development blocks of Faizabad district i.e. Masodha block on 100 women respondents (the wives of household heads) selected from 4 villages of Masodha block on the basis of proportionate random sampling technique. A semi-structured schedule was used to collect the data from rural women. Various constraints, which were observed in empowerment of rural women, were social constraints, political constraints, economic constraints and psychological constraints. The main reason for poor empowerment of rural women was noted as 'lack of knowledge about new technology'.

Kelsey K.D. (2007), contained women had been traditionally underrepresented in secondary agricultural education as teachers and students. Using critical theory as the lens for interpreting findings, the study sought to explore female teachers' and pre-service students' experiences in secondary agricultural education to better understand their perceptions of barriers to entry into the profession. Two-thirds of the women reported that they experienced gender bias from school administrators, community members, and peers; however, they exhibited a high degree of self-efficacy for teaching agricultural education that allowed them to persist in spite of any barriers. However, all discriminatory experiences were more likely to discourage women in pre-service education from entering the profession. It was recommended that agricultural teacher educators prepare female pre-service students with the knowledge and skills necessary to face and overcome gender bias in a variety of formal and informal educational contexts, especially job seeking interviews, to increase their chances of career entry into secondary agricultural education in this state.

Liepins R. (2007) stated that, agricultural geography had long been a predominantly economic field of inquiry. Recently, however, wider rural studies had incorporated more cultural approaches, and had considered the notion of discourse as a way of understanding the social construction of spaces and the social relations that were found in rural settings. Discourse was a useful medium for studying how gender was socially constructed within agriculture. Thus, this paper documents how agriculture was gendered through media and organizational discourses. It draws on literature addressing discourse and gender in agriculture, and then documents how different understandings of gender were developed through contrasting narratives of masculinity and femininity. The narratives were shown to be circulating through agriculture at both farm and industry levels. Finally, this set of location-specific readings was outlined to indicate how discourses enable the maintenance or modification of gendered power relations that operate on farms and in agricultural politics.

Srivastava and Srivastava (2009), state that the paper analysed the trends and pattern of women's employment in rural India using unit data from two types of large-scale surveys. It showed that while rural women's employment had grown over the decades, there had not been much improvement in outcomes. Women were still largely concentrated in agriculture as self-employed or casual labour. Women workers face various forms of discrimination, including job-typing that pushes them in low paying jobs. The significant predictor variables were social group, age, marital status, landholding, wealth status, and women's autonomy. Results showed that higher work participation per se did not indicate higher welfare; only when accompanied

by higher education, and/or assets did it lead to better employment outcomes. Further, education may not positively influence a woman's participation in work, but for women who were in the workforce, education was the most important determinant of better-quality non-agricultural work. Along with education, women's autonomy measured in terms of access to land, control over its operation, mobility, and willingness to join self-help groups enables her to move into non-agricultural jobs. The paper argued for policy interventions to provide work opportunities and better wages to rural women workers and builds the case for improving the education, information and skill level of women workers. It emphasises strategies to promote women's control over assets and increase her autonomy. Finally, the paper recommends policy initiatives and research to tackle the iniquitous functioning of the labour market in India, particularly with respect to valuing women's work, fixing minimum wages for home-based work and looking at the needs of women workers from the most disadvantaged social groups.

Doss et al., (2011), stated that, agriculture is an important engine of growth and poverty reduction. But the sector was underperforming in many countries in part because women, who were often a crucial resource in agriculture and the rural economy, faced constraints that reduce their productivity. The paper draws on the available empirical evidence to study in which areas and to what degree women participate in agriculture. Aggregated data showed that women comprise about 43 percent of the agricultural labour force globally and in developing countries. But this figure masks considerable variation across regions and within countries according to age and social class. Time use surveys, which were more comprehensive but typically not nationally representative, add further insight into the substantial heterogeneity among countries and within countries in women's contribution to agriculture. They showed that female time-use in agriculture varies also by crop, production cycle, age and ethnic group. A few time-use surveys had data by activity and these showed that in general weeding and harvesting were predominantly female activities. Overall, the labour burden of rural women exceeds that of men, and includes a higher proportion of unpaid household responsibilities related to preparing food and collecting fuel and water. The contribution of women to agricultural and food production was significant but it was impossible to verify empirically the share produced by women. Women's participation in rural labour markets varies considerably across regions, but invariably women were over represented in unpaid, seasonal and part-time work, and the available evidence suggests that women were often paid less than men, for the same work. Available data on rural and agricultural feminization showed that this was not a general trend but mainly a sub-Saharan Africa phenomenon, as well as observed in some sectors such as

unskilled labour in the fruit, vegetable and cut-flower export sector. This paper re-affirms that women make essential contributions to agriculture and rural enterprises across the developing world. But there was much diversity in women's roles and over-generalization undermines policy relevance and planning.

Lal and Khurana (2011) stated that, India is developing country. The main occupation is agriculture, because 70 per cent of the population is involved in this occupation. Many women in developing countries were occupied in agriculture. Women occupation in agriculture in low-income countries in Asia was between 60-80 per cent. In almost, Asian countries, the number of women employed in agriculture as a percentage of the economically active population was higher. Long standing obstacles faced by rural women in terms of limited access to productive resources (Land, Credit, Inputs, Transport, Extension Services, Storage and Technical Assistance) prevent them from adopting new technologies or encoring them economies of scale. This paper examined the ways in which greater integration through agriculture impact women and men differently and ensured implications for growth. This paper found that agriculture creates many jobs for women in agriculture sector. Jobs that bring many household resources under women control leads to greater earnings in the family. Although, women were more than ever finally employed, differences in wages earned by women and men persist in all countries. Women also had less access to productive resources specially in developing countries. Due to these reasons and women's lower education level compel the women had a greater tendency to remain in subsistence agriculture. Professional women continue to discrimination in hiring and promotion. The impact of liberalization and globalization on women was important not only because they represent almost half of the total population, but also because they face constraints, which make them less beneficial from the liberalization. Once different impacts were ascertained well designed policy responses may aid women in taking advantage of greater openness to agriculture.

Mondal, M. (2013), stated that, agriculture is an important engine for growth and poverty reduction. But the sector was underperforming in many countries in part because women, who were often a crucial resource in agriculture and the rural economy, face constrain that reduce their productivity. His study analyzed women participation in agricultural production of Sagar Island, West Bengal, India. In that paper he had tried to discuss the actual role of rural women in agricultural sector. He had shown how number of rural agricultural labor changed from 1971 to 2011. Therefore he had discussed the major role of rural women in another fields, their real problems, barriers and actual position of the society. From the

contribution of women to agricultural and food production was significant, but it was impossible to verify empirically the share produced by women. It investigated the women access to economic resources and examined the influence of selected socio-economic characteristics of women and access to economic resources on their participation in agricultural production. In this study area maximum no. of women laborers were illiterate with no formal educational status which directly informed their participation in agricultural production. Women participation in rural labor markets varies considerably across regions, but invariably women were over represented in unpaid, seasonal and part-time work, and the available evidence suggests that women were often paid less than men for the same work. This paper re-affirms that women make essential contributions to agriculture and rural enterprises across the study area as well as developing world.

National Rural Network Report (2013): The role of women in Irish agriculture had traditionally been understated due to the predominance of male farm owners and the preference to transfer farmland to a son or other male relative. A previous EU study into aspects of gender and agriculture across six European countries strongly indicates that the traditional gender role ideology was still very much alive. There was a perception that the situation regarding women may have been improving, however recent statistics highlighted that any changes that occurred have been small and that the participation of women in the sector, at ownership level in particular was low. Previous research had identified the many ways in which women's farm work is essential to the farm business and attempts had been made to bring women out of the shadows of the family farm to illustrate unequal gender relations within farm families. It was argued by researchers and practitioners alike that ideological and cultural barriers to women's real participation still exist and continue to impact negatively on gender equality. This study aimed to provide a greater understanding of the issues associated with the participation of women in agriculture and how these issues might be addressed in future Rural Development Programme measures. In addition to reporting on the outcomes, the study documents the specific circumstances of a sample of farm women. These circumstances include social, economic, environmental and organisational issues as well as other factors that impact on the participation of women in agriculture. A series of recommendations were proposed to address the issues highlighted.

Njuki et al., (2013), reported the result of baseline studies carried out in 2012 to establish the status of women in agriculture in six countries; Malawi, Tanzania, Ghana, Mali, Bangladesh, and India as part of CARE USA's Women in Agriculture Project, Pathways.

Agriculture could be an important engine of growth and poverty reduction. However, the sector was underperforming in many countries in part because women, who were often a crucial resource in agriculture and the rural economy, face constraints that reduce their productivity despite women playing a critical and potentially transformative role in agricultural growth in developing countries, they often faced persistent obstacles and economic constraints limiting further inclusion in agriculture. In some countries, women were often not recognized as farmers and face widespread restrictions on decision making about the basic resources for production i.e., land; access to productivity-enhancing inputs such as credit, fertilizer, improved seeds and extension; and control over the producing resulting from their labour and other investments. Women's ability to produce enough food was further hampered by the physically exhausting labour and drudgery associated with farming practices that had remained unchanged for generations. Women were clearly an important part of the agricultural labour force, but agriculture and agricultural value chains were equally important for women as a source of employment. Given that gender inequalities run through agricultural systems, action was required at all levels from household and community up to national, regional, and international scales. This action will require making research, extension, and market systems inclusive and accessible to both men and women farmers; implementing policy actions that reduce barriers to women's access to resources including land; engaging men to change gender relations, community structures and cultural norms that perpetuate gender inequalities; and programmatic interventions that integrate the multiple functions of agriculture (food, nutrition, incomes).

Sangar S. (2013) stated that inclusive development must involve women since poverty was particularly acute for women living in rural households. There was a need to empower these poor women through science and technology (S&T). Discussions on the recently announced Science, Technology and Innovation Policy, 2013, however, had not deliberated what the policy entails not only for women involved in S&T but also what S&T had to offer to the poor rural women and improve their lives. This was not a new phenomenon in India as S&T policies had not been particularly favourable to women in S&T since the inception of the Five-Year Plans. The foundation set up during the Nehruvian era continued during later years as well. To understand this the present article attempts to explore how the concerns of women were addressed during the initial Five-Year Plans to the current phase with particular focus on bringing socio-economic empowerment of women through S&T.

Tologbonse, E.B. et al., (2013), stated that the study was conducted to determine women farmers' participation in Women in Agriculture (WIA) programmes. The output and income of women who participated and those who did not participated in the WIA programme were also compared. A multi-stage sampling method was employed to select 272 respondents. Primary data were collected through the use of questionnaires and interview schedule and were subjected to both descriptive and inferential statistics. The mean farming experience was 11.4 years for WIA participants and 9.8 years for non-WIA participants while mean farm size for participants was 1.4ha. and 0.9ha for non-WIA participants. The main source of agricultural information was radio. Regression analysis showed that level of education, age and marital status were significantly related with level of participation. The mean output of WIA participants (688.06kg) was significantly higher than non-WIA participants (139.91kg). The difference in the mean output levels was largely attributed to participation in WIA programme. Calculated Z-statistic value (274.04) for income was significant at 5%. The findings concluded that the difference (₦118,783.69) in the mean income could be attributed to their participation in WIA programmes. Therefore, it was recommended that WIA programmes be sustained and encouraged by Kaduna State Government.

Ghosh and Ghosh (2014), said that agriculture sector as a whole had developed and emerged immensely with the infusion of science and technology. But this latest emergence was not capable of plummeting the ignorance of women labour as an integral part of this industry. In developing countries like India, agriculture continues to absorb and employ female work force but fails to give them recognition of employed/hired labour. Women constituted 38% of the agricultural labour force in developing countries. It was also estimated that 45.3% of the agricultural labour force consists of women. But a large number of women had remained as "invisible workers". Since there had been concern expressed regarding the gap between women's actual economic participation and public perception of it several researchers had attempted to overcome this invisibility through gendered empirical research studies for using on gender analysis and gender roles. This piece of research was highlighted the trend of female participation in agriculture across various Indian states. The secondary data collated for the research was used to study the growth trend of the agricultural worker from 1961-2001. Analysis was done to categorize the states on their identical behaviour of participation in agriculture by hierarchical clustering of economically active female in agriculture based on measurements like coefficient of variation, compound growth rate and work participation rate.

Zakaria et al., (2014), stated that female farmers in East Lombok were doing important works in household food security. Therefore, female farmers should have sufficient ability to be able to participate optimally to gain household food security and all family members could live healthy and active. The aims of this study were to analyze the ability level of female farmers, the participation level of female farmers and the status of household food security; and to analyze relationship between the ability level of female farmers and the participation level of female farmers, and the status of household food security. The number of respondents was 300 female farmers who had been selected randomly. The results of this study showed that female farmers did not have sufficient ability in household food security yet, the participation of female farmers had not been optimized in each stage and the household food security status was generally insecure; there was a positive and very significant relationship between the ability level and the participation level of female farmers, and the status of household food security; there was a positive and significant relationship between the participation level of female farmers and the status of household food security. Partially, there was a positive and significant relationship between the stages of obtaining benefits and the household food and energy status.

1.3 Women's Involvement in Agriculture

The dimensions of women involvement in agriculture and allied activities have been taken into consideration since settled agriculture started. The agricultural and decision-making involvement pattern of women are involving, participation of women in agriculture and allied sectors though are mutually exclusive to each other. To explore the areas of women involvement in agriculture and allied sector, the study depicts its journey from origin of agriculture to participation of women in agriculture during different historical time periods.

- The English word 'agriculture' is derived from latin *agricultura* from *ager* means 'a field' and *cultura* means 'cultivation' or "tillage of the soil". Thus, a literal meaning of the word 'agriculture' is "tillage of a field". Agriculture refers to the production of food and fibre and other goods through farming and forestry.
- The advent of settled life started with the beginning of agriculture when people started cultivating food for their livelihood. In the history of human development, women have contributed as much as men. In fact, the status of employment and work performance by women in society is an indicator of human's overall progress. The scenario of agriculture has completely changed over the historical periods but from ancient time. One aspect that has not changed, is the visualization of women as key labourer in this

sector. From archaeological records some references can be drawn about women's participation in agriculture during ancient period. During ancient period the hunting was done by males but it was not sufficient, came irregular and used to gather the food stuffs. In Palaeolithic era women used bones, stones and wood to dig up and women were the earliest inventors of tools. In Mesolithic era the major role of women was domestication of animals, taking care of families and gathering of foods. The chief characteristics of Palaeolithic period was domestication of plants. Women recognized the best soil and chose the land to be cleared for regular growing of crops. During this period farming became more labour intensive and women would need to have more children to meet this labour demand. Women used to spend more time to being pregnant and looking after their children. So, women no longer contributed much to the economy. The discovery of agriculture at the beginning of the Neolithic period appeared to be a positive step for women but by the end opposite effect was demonstrated (Owen, 2005). In the early Vedic age agriculture was the principal occupation of the people. Agriculture was their main source of income and apart from Agriculture, Animal husbandry was considered as occupation. Women played an important role in agriculture. Upper class women took leadership power in agricultural operations and socially lower-class women engaged themselves as labour with their husband in agricultural fields (Sharma & et. al., 2010). In Medieval period women were share duties of their husband's labour on the farm and also became servants in another farms. Women were introduced as an agricultural labourer in this period (Adams et. al., 1983).

- In modern period 70% of agricultural workers, 80% of food producers and 10% of food processor are women throughout the world sector (Doss 2011). The national time use in agriculture by the women is 32% of the whole day but in West Bengal it is more than 40%. Younger women contributed a higher share of this. Age between (19-35) years contributed up to 60% of the total time spend on agriculture and if food processing and preparation included with agricultural work it is exceed 60% (Jain, 1996). Food production includes crop production, food processing and preparation. It is mostly produced by men and women in a collaborative process. Mostly men provided the labour to clean the field and women used to plant and weed crops etc. women produced 60%-80% of food in developing countries like India and half of the worlds sector (Doss 2011). In India more than half of the female workforce are engaged with agriculture and allied sectors. According to female work participation rate of census 2011

Himachal Pradesh (44.8%) occupied the state wise highest position followed by Nagaland (44.7%), Chhattisgarh (39.7%) second and third respectively. West Bengal ranked 26 (18.1%).

▪ **Women's Participation in Agricultural Sectors in India**

In India, women are largely engaged with agriculture. Women's involvement varied widely with different regions, ecological sub zones, farming system, caste, class, and stages in the family cycle. Generally, the poorer families' women have greater involvement in agricultural activities. Despite women's significant and crucial role in agricultural sector and allied fields, still they have virtually no access to agricultural information, services or production assets and have very limited control over their income. The significant role of women as producer, in the agriculture and allied sectors, intense efforts will be made to ensure the benefits of training, extension and various programmes which will reach to the women in proportion to their numbers. The programmes of training for women in soil conservation, social forestry, dairy development, and other occupations allied to agriculture like horticulture, livestock including animal husbandry, poultry, fisheries etc. are expanded to benefit women workers. Majority of the female workforce (84%) are working in rural India. A very large share (73%) of this female workforce toils in the agricultural sector, mostly (96%) in rural areas. In most farming systems, females participated in all phases of agricultural production, although their roles (including decision-making) and control over resources and incomes varied greatly from place to place (Bala, 2010). The table no. 1.1 deviates that a significant feature about women main worker in India. It shows clearly an increasing trend of women worker participation in agriculture from last forty Census years.

TABLE NO. 1.1 PERCENTAGE OF FEMALE MAIN WORKERS TO TOTAL FEMALE POPULATION (1981 TO 2011)

Census Year	Percentage to Total Female Population				
	Female Main Workers	Cultivators	Agricultural Labourers	Household Industry	Other Workers
1981	13.99	4.65	6.46	0.64	2.24
1991	15.93	5.51	7.05	0.55	2.82
2001	14.68	5.11	4.51	0.95	4.11
2011	25.5	24.0	41.1	5.7	29.2

Source: Indian Labour Year Book, 2011

Table no. 1.2 explain the total worker in rural and urban areas in Census 2011. Though the female works both outside and inside of the home but they are not recognised as an independent rather than a supportive worker. That's why the decadal work participation of male is higher than women. On the other hand, most of the female are engaged in rural areas agriculture.

TABLE NO. 1.2 TOTAL WORKERS IN INDIA - 2011 CENSUS

Population/ Workers		Persons	Male	Female
Population	Total	1,21,05,69,573	62,31,21,843	58,74,47,730
Workers		48,17,43,311	33,18,65,930	14,98,77,381
Percentage of Workers		39.79	53.26	25.51
Population	Rural	83,34,63,448	42,76,32,643	40,58,30,805
Workers		34,85,97,535	22,67,63,068	12,18,34,467
Percentage of Workers		41.83	53.03	30.02
Population	Urban	37,71,06,125	19,54,89,200	18,16,16,925
Workers		13,31,45,776	10,51,02,862	2,80,42,914
Percentage of Workers		35.31	53.76	15.44

Source: Indian Labour Year Book, 2011

Note: Workers include both main workers and marginal workers

▪ **Women's Role in Agricultural and Allied Sectors in West Bengal and Study Area**

The economy of West Bengal as well as Koch Bihar district is based on agricultural and allied activities. In West Bengal during 1951 Census 14.9% persons are directly associated with agriculture whereas Koch Bihar has 22.4% population who are engaged with agricultural activities.

TABLE NO. 1.3 CULTIVATORS AND AGRICULTURAL LABOURERS OF DIFFERENT CENSUS YEARS OF WEST BENGAL AND KOCH BIHAR

Population	Census Years									
	1971		1981		1991		2001		2011	
	West Bengal	Koch Bihar	West Bengal	Koch Bihar	West Bengal	Koch Bihar	West Bengal	Koch Bihar	West Bengal	Koch Bihar
Cultivators (%)										
Persons	31.97	67.95	29.76	52.02	28.40	48.18	19.8	38.5	14.72	32.34
Male	33.58	69.10	31.40	54.29	30.15	51.32	21.5	40.6	16.84	35.81
Female	12.12	29.87	14.67	13.72	16.23	19.59	10.6	26.8	7.67	21.95
Agricultural labourers (%)										
Persons	26.46	15.59	25.23	27.24	24.56	26.04	19.6	25.0	29.32	34.74
Male	25.00	15.28	23.69	26.58	22.65	23.91	19.2	22.9	27.9	30.45
Female	44.50	26.07	39.43	38.37	37.88	45.47	22.1	36.4	34.03	47.56

Source: Indian Labour Year Book, 2011

In 1961 Census, West Bengal had 123 male and 23 female cultivators per thousand persons who are working as cultivators and agricultural labours. Koch Bihar also had 51 male and 8 female cultivators per thousand persons who are working as cultivators and agricultural labours (Census 1961). According to Census 1971, to 2011 percentages of cultivators and agricultural labourers of West Bengal and Koch Bihar district are stated table no. 1.3.

Women played an important role and perform numerous labour-intensive jobs in agricultural operations such as weeding, hoeing, grass cutting, picking, collection of jute fibre etc. in the Koch Bihar district of West Bengal. Women are also expected to collect wood from fields. This wood is used as a major fuel source for cooking. Because of the increasing population, over grazing and desertification in West Bengal, women faced difficulties to searching of firewood. Rural women are also responsible for farm activities, such as caring of livestock and its other associated activities like milking, milk processing etc. The majority of farmers have their own livestock. Livestock is the primary subsistent activity which used to meet household food needs as well as supplement of farm incomes. The strength of livestock is mainly influenced by various factors such as farm size, cropping pattern, availability of range-lands including fodder and pasture. Evidently, rural women are involved in almost all livestock related activities. Mostly women are engaged in maintenance of animals, animal-sheds, putting fodder and water and milking the animals. Rural women are also responsible for collection of dung, preparing dung cakes which is an activity that also brings additional income for poor families. Most of the livestock management activities are predominantly performed by females. Majority of women are involved in shed cleaning and collection of dung which is used to produce farm yard manure. Males, however, shared the responsibility of taking care of sick animals. It is evident that the women are playing a dominant role in the livestock production and management activities in Koch Bihar district of West Bengal. Poultry farming is one of the major sources of rural economy along with agricultural activities. Even though rural women are not using modern management techniques, such as vaccination and improved feed, but their management capacity of poultry enterprise is impressive. Every year, income from poultry farming has been rising in this state. Rural women also help to produce the staple crops like rice, wheat, jute, potato but her contribution is considered secondary in crop production. Women farmers are generally ignored in development strategies

and policies. In most of the cases, both men and women farmers do not have access to adequate resources, but women are even more constrained due to cultural, traditional and sociological factors in Koch Bihar district of this state.

1.4 Objectives

Keeping all above things in view the present study is conducted in the light of the following objectives.

1. To identify the socio-economic background of the farm women associated with the agriculture and allied activities in the study area.
2. To evaluate the involvement of farm women in agriculture and allied activities.
3. To assess the involvement of farm women in decision making process in agriculture and allied sectors and household activities.
4. To analyze the relationship between the socio-economic status of farm women and involvement of the farm women in agriculture and allied activities.
5. To identify the problems of farm women regarding their involvement in agriculture and to find out the way to solve these problems.

1.5 Hypothesis

Based on the available literature and objectives the present study is designed to test the following hypothesis.

1. Farm women actively participate in agriculture and allied fields along with household activities.
2. Farm women actively participate in decision-making process of agriculture and allied sector.
3. Farm women's involvement is significantly associated with their socio-economic attributes.

1.6 Methodology

To conduct particular research in any direction there is a need of appropriate methodology. The methodology incorporates different ideas for conducting the research in a smooth way and it helps in understanding the techniques and methods which are utilized to design to study, collect the information, analyze the data and interpret the data for relocation of truth and formulation of theories. The research methodology includes the following steps:

1.6.1 Locale of Research

The present study is conducted in 12 CD blocks of Koch Bihar district. The district is selected purposively due to the following reasons;

- The researcher's close familiarity with respect to the area, people, official and local dialects.
- As per 2011 Census of India, Koch Bihar has a population of 28,19,086 out of which 14,51,542 are males and 13,67,544 are females. Total 3,64,797 cultivators depend on agriculture farming out of 3,02,745 are men and 62,052 are women. 3,91,875 people works as agricultural land as labourer, out of which 2,57,425 are men and 1,34,450 are women. Koch Bihar is an agricultural district with very large number of people dependent on agriculture.
- The highly cooperative and responsive farm women trying to improve their socio-economic condition.
- Ample scope to get relevant information regarding women's involvement in different activities in agriculture and allied sector.
- Easy accessibility of the area.

1.6.2 Sampling Design

Random sampling technique is followed for selecting the area and the respondents of the present study. The district is selected systematically; the blocks from sub-division are selected with the help of simple random sampling. Figure no. 1.1 and map no. 1.1 shows the selection of the respondents of the study area. In Koch Bihar district, there are five sub division names as Mekhliganj, Mathabhanga, Cooch-Bihar Sadar, Tufanganj and Dinhata. The sub divisions are further divided into 12 CD blocks. Mekhliganj sub division is divided into two CD blocks namely Mekhliganj and Haldibari. Mathabhanga sub division is divided into three CD blocks namely Mathabhanga I, Mathabhanga II and Sitalkuchi. Cooch-Bihar Sadar sub division is divided into two CD blocks name as Cooch-Bihar I and Cooch-Bihar II. Tufanganj sub division is divided into two CD blocks name as Tufanganj I and Tufanganj II. Dinhata sub division is divided into two CD blocks namely Dinhata I, Dinhata II and Sitai. An exhaustive list of farm women within the CD blocks is prepared. From this total list, twelve hundred farm women are selected randomly as respondents from each CD block of the district for the present study.

RESEARCH FRAME OF THE RESEARCH WORK

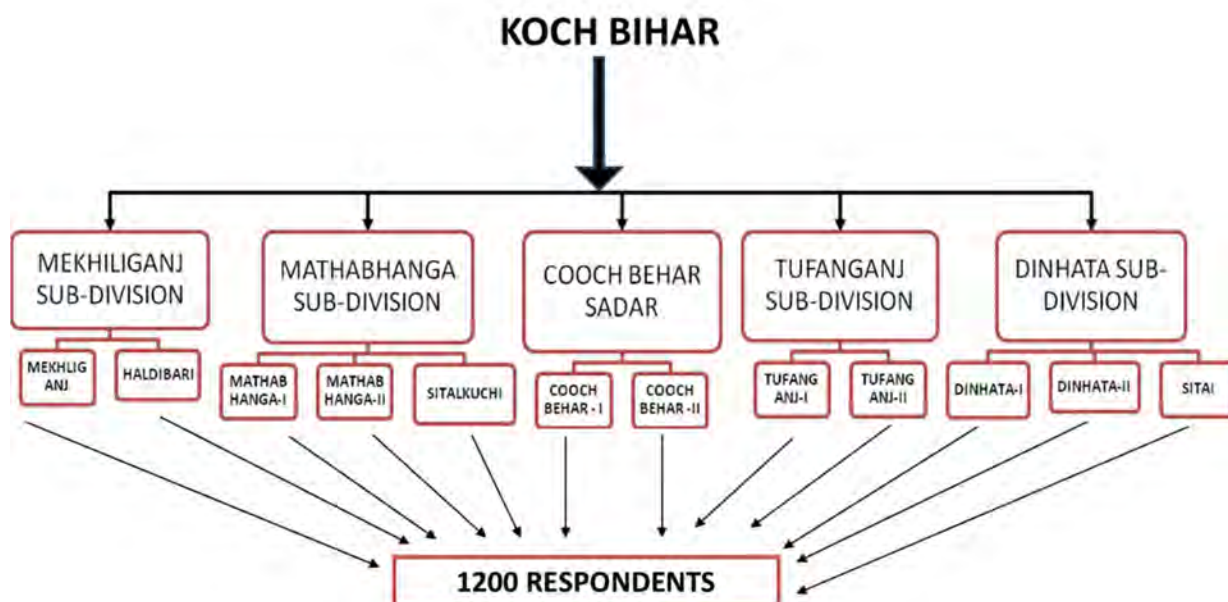
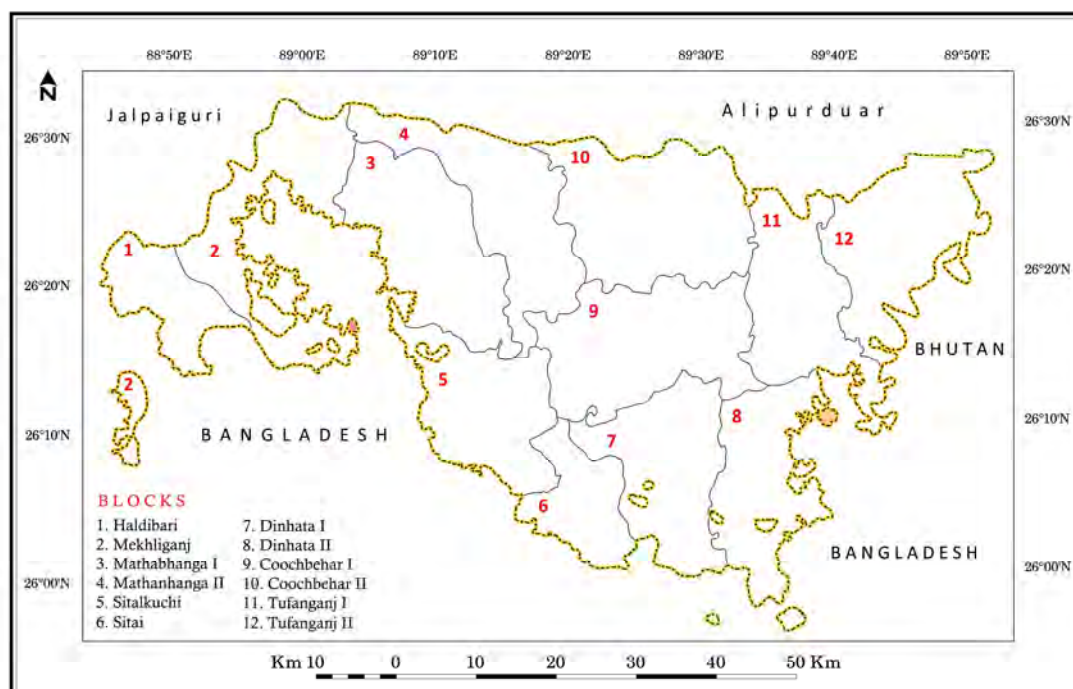


FIGURE NO 1.1

Source: Census, 2011

SAMPLE LOCATION IN CD BLOCKS OF KOCH BIHAR DISTRICT



MAP NO 1.1

Source: Census, 2011

1.6.3 Pilot Study

A pilot study was conducted in the selected study areas before conducting the actual study. In course of this survey informal discussion was carried out with farm women, local leader and agricultural functionaries of the locality. An outline of background information, their opinion, settlement pattern, decision making process was obtained for the construction of reformative working tools.

1.6.4 Variable and their Measurements

On the basis of the delineated objectives the involvement indices are considered as dependent variables and the different socio-personal, economic variables are considered as independent variables. The following variables are considered for the study.

Status of the Family It refers to the position that occupy by the farm women in the family. The farm woman whose husband has migrated and who is widow has to act as family head. In nucleus family farm woman act as a family co-head. If the farm woman occupies the status of daughter or daughter in law is dominated by the elder members of the family. Thus, farm women are classified into four categories - daughter, daughter-in-law, family-co-head, family head. While collecting the data the present study has given prime importance upon family head category.

Age Age is the one's orientation towards development and growth. An individual behaves according to her orientation and her orientation gives to determines her character. The chronological ages developed through experiences and introspection, exert influence in orienting the participation process. As a result, the present study has considered the age of women as a predictor variable and directly registered the chronological age of the responded women.

Religion & Caste Caste is an aggregate of individual whose share of obligations and privileges are fixed by birth, as well as sanctioned and supported by religion which comprises of Hindu, Muslim, Christian and others. This variable will be with the help of four distinguished caste prevailing in the present social system namely Scheduled Tribe, Scheduled Caste, Other Backward Caste, General caste. The variable is measured with the help of Bhairamkar's scale on caste (2010).

Education According to the International Encyclopedia of the Social Science, education is an institutionalized form of socialization to adult roles. Education helps an individual to know and give shape and direction to the thinking processes. The variable education is operationalized as

the formal education successfully completed by the respondents and it is measured with the help of the scale derived by Hadole and Tawade (2005).

Family Education Status It refers to the education status of all the members of the family in the eligible age group for formal education i. e. excluding the children below six years of the age. This variable is measured with the help of procedure followed by Bhairamkar (2010). The total score is obtained by adding the respective standard completed by each member and the Family Education Status score is obtained by dividing the total score with eligible number of family members. Family Education Status is calculated with the help of following formula;

$$\text{Family Education Status} = \frac{E_1 + E_2 + \dots + E_n}{N}$$

Family Occupation Occupation is considered as one of the factors which influence the decision making by farm women. Accordingly, five prominent professions like wage earning (working on others farm), agriculture, allied fields, business, services are considered.

Family Annual Income Annual income can give inputs in case of developing the attitude towards participation in any activities. The annual income is measured as the earnings of the family from primary and secondary sources of income per year in rupees.

Family Annual Expenditure It shows the attitude of the respondent's family towards the consciousness on health, education, savings etc.

Land Holding Land holding is the representation of economic status within a rural system. The land holding is measures as total land of respondent family in Bigha. This variable is measured with the scale produced by Markad (1996).

Farm Power The possession of farm power indicates the efficiency of an individual in case of managing the agriculture and livestock enterprise. It is categorized as, no farm power, indigenous farm implement, one pair of drought animal, power tiller, tractor.

Irrigation Irrigation is one of the important aspects of cultivation practices like selection of crops, selection of variety, time of sowing of the crops etc. This variable is measured as no irrigation, tank, shallow tube well, river lift pump, deep tube well. This variable is measured with the scale developed by Nirban (2004).

Possession of Assets The information related to possession of assets of the respondent's family is obtained and is considered. The variable is measured as cart, bicycle, radio, improved plough, sprayer (heavy weight/light weight), paddle thresher, seed drill, tractor, power tiller, television, telephone/mobile, refrigerator, motor cycle. Bawajir and Nandapurkar (1985) developed the scale for possession of assets.

Livestock Possession The information pertaining to the growing population available to the respondents is obtained and measured by Hadole's scale (2005), considering piggery, cow (local/cross bred), goat/sheep, fishery, buffalo, poultry.

House Type The type of house owned by the respondents is taken into consideration. The variable house types as it has some impact on the participation process. It is measured by the Supe's scale (2007) by assigning the score as no house, hut, kutcha, mixed, pucca and mansion.

Risk Preference It is the degree to which a farmer is oriented towards risk and uncertainty and has courage to face the problems in farming. This variable is measured with the help of scale developed by Supe (2007). This scale consists of six items, in which first four statements are positive and two statements are negative. The responses are recorded on five-point continuum ranging from strongly agree to strongly disagree.

Scientific Orientation It is the degree to which a farmer is oriented to the use of scientific methods in decision making and farming. This variable is measured with the help of scale developed by Supe (2007). This scale consisted of six items, in which five statements are positive and one statement is negative. The responses are recorded on five-point continuum ranging from strongly agree to strongly disagree.

Economic Motivation It is defined as the occupational success in terms of profit maximization and the relative value placed by a farmer on economic basis. This variable is measured with the help of scale developed by Supe (2007). This scale consisted of six items, in which five statements are positive and one statement is negative. The responses are recorded on five-point continuum ranging from strongly agree to strongly disagree.

Independence Scale It is the degree to which a farmer places positive value independence or autonomy in decision-making. This variable is measured with the help of scale developed by Supe (2007). This scale consisted of six items, in which five statements are positive and one statement is negative. The responses are recorded on five-point continuum ranging from strongly agree to strongly disagree.

Management Orientation It is operationally defined as the degree to which a farmer is oriented towards scientific farm management comprising of planning, production and marketing function of the farm. This variable is measured with the help of scale developed by Samanta (1977). The scale consists of eighteen statements, six statements each for planning, production and marketing orientation. In each group positive and negative statements are mixed, retaining at the same time a more or less same order of statements. Each item will be provided with four-point response continuum. The positive statements are given a score of four for strongly agree, three for agree, two for disagree and one for strongly disagree response and vice-versa in case of negative statements. The score for each individual on the management orientation scale is obtained by summation of the score awarded for each one of the items included.

Attitude towards Agriculture It is measured by scale developed by Mathew and Reddy (1989). This scale consists 12 statements and responses are rated on five-point continuums ranging from strongly agree to strongly disagree.

Attitude towards Animal Rearing and Poultry It is measured by the scale developed by Rajkamal & Kunzru (1993). This scale consists 10 statements and response will be rated on three-point continuum ranging from agree to disagree.

Problem Associated with Agriculture & Allied Sector The study will help to gain knowledge and develop future plan of work for that locality. The major problems of farm women are identified with the help of Ranking Based Question (RBQ).

Activity-Involvement Index (AII) Activity-Involvement Index is the physical involvement in the agriculture, livestock and poultry rearing activities. The women bear the responsibility of performing of every activity of agriculture, livestock and poultry rearing activities. The variable is operationalized as the performance of activities on the bases of their physical involvement. It is measured with the help of three-point scale as no involvement, 0; occasional involvement, 1; independent involvement, 2. It is measured by scale developed by Pareek-Trivedy (1964). The Activity-Involvement Index (AII) is calculated as;

$$AII = \frac{\sum O_{Aj}}{\sum M_{Aj}} \times 100$$

where, O_{Aj} = obtained activity score (weighted) in j^{th} enterprise /crop/area

M_{Aj} = maximum activity score (weighted) achievable in j^{th} enterprise/crop/area

Decision-Involvement Index (DII) Women have engaged themselves in decision making process of every sphere of agriculture, livestock and poultry enterprise. The variable is operationalized as the involvement in decision making practice with respect to the selective activities in agriculture and livestock enterprise. It is measured with the help of three-point scale and score is assigned ‘0’ as not considered; ‘1’ as considered after consultation with others; and ‘2’ as considered independently. It is measured by scale developed by Pareek-Trivedy (1964). The Decision-Involvement Index (DII) is calculated with the help of following formula;

$$DII = \frac{\sum O_{Dj}}{\sum M_{Dj}} \times 100$$

where, O_{Dj} = obtained decision score (weighted) in j^{th} enterprise/ crop/area

M_{Dj} = maximum decision score (weighted) achievable in j^{th} enterprise/crop/area

Overall-Involvement Index (OII) The Overall Involvement Index is operationalized as the composite from of Activity-Involvement Index and Decision-Involvement Index. It is measured by scale developed by Pareek-Trivedy (1964). It is measured as the composite score of Activity-Involvement Index and Decision-Involvement Index and calculated with the following equation;

$$DII = \frac{AII + DII}{2} \%$$

Activity Involvement Score (AI Score) It refers to all the agricultural and allied activities like livestock rearing with domestic duties of a farm woman done by herself. The frequency is measured as no involvement, occasional involvement and independent involvement with score 0,1 and 2 respectively. This scale is developed by Pareek-Trivedy (1964). Based on the total score obtained by the respondents, at first obtained score is calculated by (average farm activity score plus average livestock activity score plus average household activity score) divided by $n=3$. n refers to total types of activities done by farm woman. Then AI score is measured by

$$\text{Activity Involvement Score (AI Score)} = \frac{\text{Obtained Score} - \text{Maximum Score}}{\text{Maximum Score} - \text{Minimum Score}}$$

Decision Making Involvement Score (DI Score) It is the degree to which a farm woman is positively oriented and evaluated and take prompt decisions for the farm as well as for her home. It consists of 3-point response namely, not considered, considered after consultation with other and considered independently with scores of 0, 1 and 2 respectively. This scale is developed by Pareek-Trivedy (1964). Based on the total score obtained by the respondents at first obtained decision-making score is calculated by (average decision making in farm activity score plus average decision making in family matters score plus average decision making in economic aspects score) divided by $n=3$. n refers to total types of decision making done by farm woman. Then DI score is measured by

$$\text{Decision Making Involvement (DI Score)} = \frac{\text{Obtained Score} - \text{Maximum Score}}{\text{Maximum Score} - \text{Minimum Score}}$$

1.6.5 Method of Data Collection

Primary Data Data is collected with the help of structured interview scheduled which is framed after conceptualizing and operationalizing their measurements. The pretesting is conducted for evaluating the validity and reliability of the structured interviewed. The personal interview method is followed to collect the information from sample farm woman in the study area.

Secondary Data Secondary data are collected from Census report of India; District Statistical Handbooks; Statistical Abstracts of West Bengal; various publications like books, journals, articles, topographical maps.

1.6.6 Statistical Tools Used The following statistical tools have been used.

Mean Measure of central tendency (or statistical averages) tells us the point about which items have a tendency to cluster. Such a measure is considered as the most representative value for the entire mass of data. Mean is the simplest measurement of central tendency and is a widely used measure. It is mainly used to consist in summarizing the essential features of a series and in enabling data to be compared. It is amenable to algebraic treatment and is used in further statistical calculations. It is a relatively stable measure of central tendency. But it suffers from some limitations viz., it is unduly affected by extreme; it may not coincide with the actual value of an item in a series, and it may lead to strong impressions, particularly when the item values are not given with the average. However, mean is better than other averages, especially in economic and social studies where direct quantitative measurements are possible.

Coefficient of Variation Divide the standard deviation by the arithmetic average of the series, the resulting value is known as coefficient of standard deviation. It happens to be a relative measure, and is often used for comparing with similar measure of other series. When this coefficient of standard deviation is multiplied by 100, the resulting figure is known as coefficient of variation. Sometimes, the square of standard deviation, known as variance, is frequently used in the context of analysis of variation.

The standard deviation (along with several related measures like variance, coefficient of variation, Z score, etc.) is used mostly in research studies and is considered as a very satisfactory measure of dispersion in a series. It is amenable to mathematical manipulation, because the algebraic signs are not ignored in its calculation. It is less affected by fluctuations of sampling. These advantages of standard deviation and its coefficient make a very popular method for the scatteredness of a series.

Karl Pearson's Coefficient of Correlation is the most widely used method to measuring the degree of relationship between two variables. This coefficient assumes the following:

- That, there is linear relationship between the two variables;
- That, the two variables are causally related which means that one of the variables is independent and the other one is dependent;
- A large number of independent causes are operating both in variables, to produce a normal distribution.

Karl Pearson's coefficient of correlation

$$r = \frac{\sum(X_i - \bar{X})(Y_i - \bar{Y})}{n \cdot \sigma_x \sigma_y}$$

Where $X_i = i^{\text{th}}$ value of X variable

$\bar{X}$ = mean of X

$Y_i = i^{\text{th}}$ value of Y variable

$\bar{Y}$ = mean of Y

n = number of pairs of observations of X and Y

σ_x = Standard deviation of X

σ_y = standard deviation of Y

Karl Pearson's coefficient of correlation is also known as the Product Moment Correlation Coefficient. The value of 'r' lies between ± 1 . Positive values of r indicate positive correlation between the two variables (i.e., changes in both variables take place in the same direction), whereas negative values of 'r' indicate negative correlation i.e., changes in the two variables taking place in the opposite directions. A zero value of 'r' indicates that there is no association between the two variables. When r (+) 1, it indicates perfect positive correlation and when it is (-) 1, it indicates perfect negative correlation, meaning thereby that variations in independent variable (X) explain 100% of the variations in the dependent variable (Y). It can also say that for a unit change in independent variable, if there happens to be a constant change in the dependent variable in the same direction, then correlation will be termed as perfect positive. But if such change occurs in the opposite direction, the correlation will be termed as perfect negative. The value of 'r' nearer to + 1 or – 1 indicates high degree of correlation between the two variables.

Co-efficient of Variation (CV) The Co-efficient of Variation (CV) is a statistical measure of the dispersion of data points in a data series around the mean. The Co-efficient of Variation represents the ratio of the standard deviation to the mean, and it is a useful statistic for comparing the degree of variation from one data series to another, even if the means are different from one another.

$$\text{Co-efficient of Variation (CV)} = \frac{\text{Standard deviation}}{\text{Mean}} \times 100$$

1.7 Scope and Impact of the Study

The economy of the study area mainly depends on agriculture. There is no noticeable industry except one tea factory in this area causing low income of the people. Infrastructural facilities like transport network, industry, education and medical facilities are very poor particularly in rural areas. The rate of increase of population has increased the pressure on land and reduced the man-land ratio. Although, improved technology in relation to crop production has been introduced in this area but farm women are not aware of this phenomenon. Besides, numbers of male, living their homelands have migrated to other places within and outside the state to earn money, causing shortage of male labour and more involvement of female labour. Moreover, rural women actively participate in number of agricultural operations, maintenances of livestock, fisheries etc. There is scope to increase productivity of this area through training of farm women on modern technology – following sustainable agriculture. To improve the efficacy of farm women it is essential to have a detail study on this aspect so that policy makers

take more care in making the policies for the farm women. The outcome of the study will be useful for the associated Government departments and other agencies as farm women have the potentialities for improvement of socio-economic status through their participation in agriculture and allied fields.

1.8 Conclusion

From the ancient period to modern society, women have an important role in agriculture. Many agriculture-based countries like India, agriculture no doubt is sustained upon the rural women who have been poorly rewarded in terms of income and access to resources. It is important now to recognize that area and provide equal opportunities to the female labour and resources such as land, assets and credit and suitable share in agricultural income to the unpaid women workers in the family farms. They need to be recognized as farmers and should give their due share. In developing countries like India, agriculture continues to absorb and employed two third of the female work force but fails to give them recognition of employed labour. The female labour force in developing nations still faces the oppressive status and majorly responsible for family and household maintenance. In addition to that, their contribution as an agriculture labour is suppressed in the family labour who works in farm in addition to her regular household chores. These problems of the rural women are further accentuated by the tribulations of illiteracy, underdevelopment, unemployment and poverty. Despite, the major part of farm labour force in agriculture their needs and problems are somewhat ignored by the rural development initiatives. The multi-tasking potentiality of female labour brought significant propositions for agricultural productivity, rural production, economic vitality, household food security, family health, family economic security and welfare.

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