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Understanding Gender-Based Challenges in Agricultural Innovation Adoption in Pakistan

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This study investigates the impact of gender roles on the adoption of agricultural innovations in Pakistan, particularly focusing on rice farming. The research highlights the significance of gender-sensitive approaches in enhancing agricultural practices and performance. A predominantly male-headed household structure (90.2%) reflects traditional gender norms, which influence the adoption and implementation of new farming techniques. Women, primarily engaged in household work (69.1%) and limited agricultural activities (30.1%), face substantial barriers due to socio-economic and cultural factors, including restricted access to resources and technical knowledge. Educational disparities are notable, with high illiteracy rates among both men (92%) and women (96.2%) over 17 years old, and lower literacy levels in young children, particularly girls. These educational gaps exacerbate existing economic inequalities and hinder the adoption of innovative practices. Women's involvement in income-generating activities is predominantly restricted to household work and limited agricultural labor, highlighting the need for expanded economic opportunities and access to alternative livelihoods. The study underscores the impact of traditional gender roles on labor division and innovation adoption. Children's early involvement in agricultural and household tasks further illustrates the socio-economic pressures faced by rural families, affecting their educational opportunities and perpetuating poverty. The findings advocate for targeted interventions to address educational and economic inequalities, reduce child labor, and promote gender-sensitive agricultural innovations to enhance socio-economic development in rural communities.

Keywords: Gender Roles, Farmer, Adoption, Innovation, and Paddy.

Introduction:

The adoption of agricultural innovation is the act of embracing, implementing, and consistently using a new idea, farming practice, or technology in the production process. According to this study, farmers that are reluctant to adopt innovations use traditional methods, machinery, and practices to grow and process rice. Developing gender-sensitive innovations in paddy farming can improve performance and efficiency. Nevertheless, neglecting to do so could result in a lack of acceptance or implementation. For innovations to be effectively embraced, they must exhibit the following five attributes: trialability, observability, complexity, compatibility, and relative advantage. Various factors can influence the adoption of innovation, including the availability of necessary resources, the perceived benefits among local persons, the dissemination of information, and societal limitations. Implementing the adoption of innovative practices has the potential to enhance the quality of life for economically disadvantaged farmers and consumers in Tanzania [1]. Women encounter more obstacles than men when it comes to obtaining the necessary resources for attaining success in various areas, even if they have access to opportunities for advancement. This

insight highlights the importance of giving greater priority to the process of adopting something new. This process entails the acquisition of knowledge regarding the innovation, the development of a mentality towards it, the decision-making process of accepting or rejecting it, the implementation of the decision, and the subsequent confirmation of its effectiveness. Assume that advancements are either completely ignored by both male and female farmers, or are adopted at a slower rate [2]. It is imperative to identify the most effective methods for encouraging and nurturing inventions through involvement, to ensure that both genders can reap the rewards. The application of technologies in rice growing and processing demonstrates promise in mitigating inefficiencies. Using this approach, companies can alter the personnel in charge of executing manufacturing and processing operations, as well as the techniques used. Advancements in rice cultivation have varied impacts on men and women. For example, men may experience a reduction in the level of effort, duration, and vitality required, or conversely. As a result of the uneven distribution of innovation adoption, men and women may take on different roles in paddy production [3].

A vital component of gender-based labor allocation is understanding the opportunities, limitations, and motivations that individuals of different genders face in the socio-economic realm [4]. The persistence of gender-based labor divisions is worsened by a widespread absence of gender awareness at all levels of social systems, which ignores the distinct needs and requirements of both males and females. Male and female smallholder farmers in the Mvomero District participate in paddy cultivation to generate both food and income [5] [6]. Women's potential in paddy farming is constrained by socio-economic and socio-cultural factors, particularly their restricted authority and limited access to resources. Despite the high cost, women residing in rural regions frequently have access to these resources. Nevertheless, they lack productive assets such as land and innovations. As a result of their limited impact on progress, women are therefore forced to rely on conventional technologies. This problem hampers the ability of women to contribute effectively in paddy cultivation. Considering that women are primarily responsible for the majority of the labor in paddy farming, they have a pivotal position in the industry [7]. Geographical variety exists in the extent to which women contribute to rice farming, especially in areas where women are involved in paid work or employed in other agricultural or non-agricultural activities. However, women face numerous obstacles in carrying out their responsibilities in paddy farming due to their limited access to technical knowledge and technologies that may reduce their labor and generate more income. Some argue that women bear a disproportionate burden since they dedicate a substantial amount of their time and energy to tasks related to agricultural cycles, processing, and home responsibilities. Therefore, incorporating improvements can decrease the duration and monotony that women must suffer [8] [9].

Agriculture plays a crucial role in Pakistan's economy, contributing 20.9% to the GDP through various activities including major and minor crops, as well as vegetable and fruit production. This sector involves both men and women, with women significantly contributing to agricultural production, livestock management, and cottage industries (Rasheed, 2004). Despite the substantial role of women, data on their specific contributions remains limited. Women are actively involved in crop production tasks such as seed cleaning, wheat and maize cultivation, and vegetable production. Research indicates that rural women participate in agriculture and livestock activities at a higher rate (79.4%) compared to rural men (60.8%). However, women's work is often undervalued and not classified as paid employment, despite their involvement in tasks like harvesting (16.3%), stripping sugarcane leaves (12.28%), cotton picking (11.90%), and bringing in farm produce (14.76%) [10].

Additionally, women in joint families often experience higher crop production income compared to those in single-family settings. Nevertheless, rural women face numerous challenges both at home and on the farm. Only 10% of women have access to credit and loan

facilities, and two-thirds of the world's illiterate population are women and girls, with only 5% of extension services targeting them. Women often encounter significant information gaps, particularly in production and technology, due to inadequate training and resources. Research on the diffusion of agricultural innovations within Pakistan's socio-cultural context is scarce. Mass media has become an important tool for spreading agricultural technologies more rapidly than personal contacts. Literate farmers can access agricultural information through electronic media (radio, TV, internet) and print media. The introduction of ICT interventions in agriculture has begun, with radio and TV used to raise awareness about new agricultural technologies. However, the timing of agricultural programming needs reassessment. Reliable research on the diffusion process is essential for developing effective policies and mass communication programs to support agricultural advancements and poverty reduction in remote areas [11] [12].

Methodology:

Study Design:

This study employed an exploratory design to investigate the association between gender roles and the adoption of selected agricultural innovations among farmers in Pakistan. It also considered work burden as a moderator variable. The aim was to elucidate how gender roles impacted the adoption of agricultural innovations and how work burden influenced this relationship.

Annotation Scheme:

An annotation scheme was developed to structure the research, with codes organized under three main variables:

Independent Variable: Gender Roles:

Codes:

- Decision-making roles in agriculture
- Access to agricultural resources
- Participation in agricultural activities
- Influence of traditional gender norms
- Membership in agricultural organizations

Moderator Variable: Work Burden:

Codes:

- Time allocation between domestic and agricultural work
- Impact of work burden on innovation adoption
- Perceived difficulty of integrating new practices

Dependent Variable: Adoption of Innovations:

Codes:

- Types of innovations adopted
- Barriers to adoption
- Benefits perceived from innovations
- Rate and extent of adoption

Data Collection Methods:

Quantitative Tools:

Structured Household Survey Questionnaire:

Description:

The survey was administered using a Computer Assisted Personal Interview (CAPI) application to collect data on gender roles and adoption of innovations. It covered aspects such as types of innovations adopted, reasons for adoption or non-adoption, and the influence of gender roles and work burden on these decisions.

Implementation:

Surveys were conducted in households across selected districts, ensuring a representative sample of different agricultural practices and gender dynamics.

Qualitative Tools:

Key Informant Interviews (KIIs):

- **Description:** Semi-structured interviews were conducted with experts, community leaders, and extension officers to provide insights into gender dynamics, innovation adoption, and barriers faced.
- **Implementation:** Key informants were selected through purposive sampling, and interviews were conducted in person or via remote methods if necessary.

Focus Group Discussions (FGDs):

- **Description:** FGDs were organized with male and female farmers, categorized by age and farming context. Discussions explored perceptions of gender roles and barriers to adopting innovations.
- **Implementation:** Separate FGDs were conducted for different groups including men, women, and youth. Each FGD was moderated to ensure comprehensive and relevant discussions.

Direct Observations:

- **Description:** Observations were made of farming practices to understand how gender roles influenced the adoption of innovations.
- **Implementation:** Observers documented practices and interactions in the field, focusing on how innovations were implemented and any gender-related dynamics observed.

Sample Size and Sampling:

Sample Size:

- **Household Surveys:** A sample size of 150 households was targeted across selected districts to ensure adequate representation of various agricultural practices and gender roles.
- **Focus Group Discussions (FGDs):** 30 FGDs were held, with 5-8 participants in each group, categorized by gender and age.

Sampling Strategy:

- **District Selection:** Districts were selected based on variations in agricultural practices and gender dynamics.
- **Household Sampling:** Random sampling was used to select households from a list provided by local agricultural departments.
- **FGD and KII Sampling:** Purposive sampling was employed to identify participants knowledgeable about gender roles and innovation adoption.

Data Collection Process:

Questionnaire Design and Pre-testing:

- **Development:** Questionnaires were developed with input from agricultural experts and gender specialists. They were pre-tested in the field to ensure clarity and relevance.
- **Revisions:** Based on pre-testing feedback, questionnaires were refined and finalized.

Data Analysis and Reporting:

Quantitative Analysis:

- **Data Processing:** Survey data were processed using statistical software to identify patterns and associations between gender roles and innovation adoption.
- **Analysis:** Statistical tests were conducted to evaluate the influence of gender roles and work burden on innovation adoption.

Qualitative Analysis:

- **Transcription and Coding:** Qualitative data from FGDs and KIIs were transcribed and coded using qualitative analysis software. Themes related to gender roles and innovation adoption were identified and analyzed.

Findings and Examination:

Results and Discussion: Gender Roles in Farming:

This section presents an in-depth analysis of the socio-economic profile of the households surveyed, emphasizing gender roles in farming, work burden, and its effects on child labor. The findings are based on data collected from 112 households in Punjab, with a particular focus on gender-specific tasks and responsibilities.

Household Demographics and Structure:

The surveyed sample consisted of 101 male-headed households (90.2%) and 11 female-headed households (9.8%). This distribution highlights a predominantly male-dominated household structure.

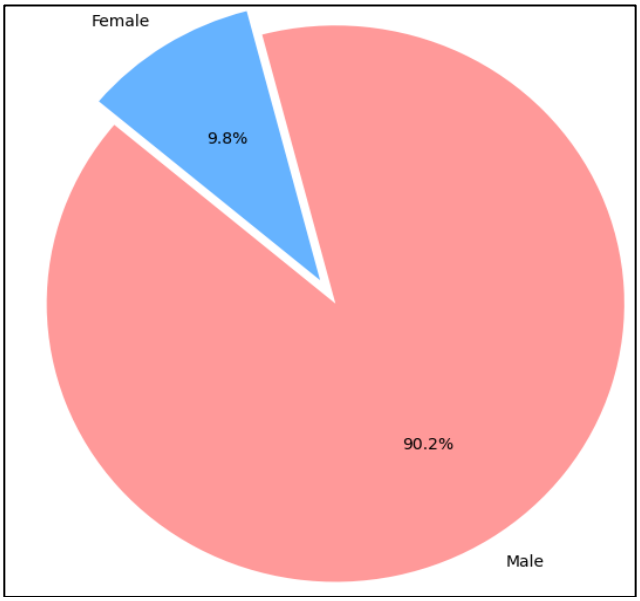

Figure 1: Gender of the Head of Households

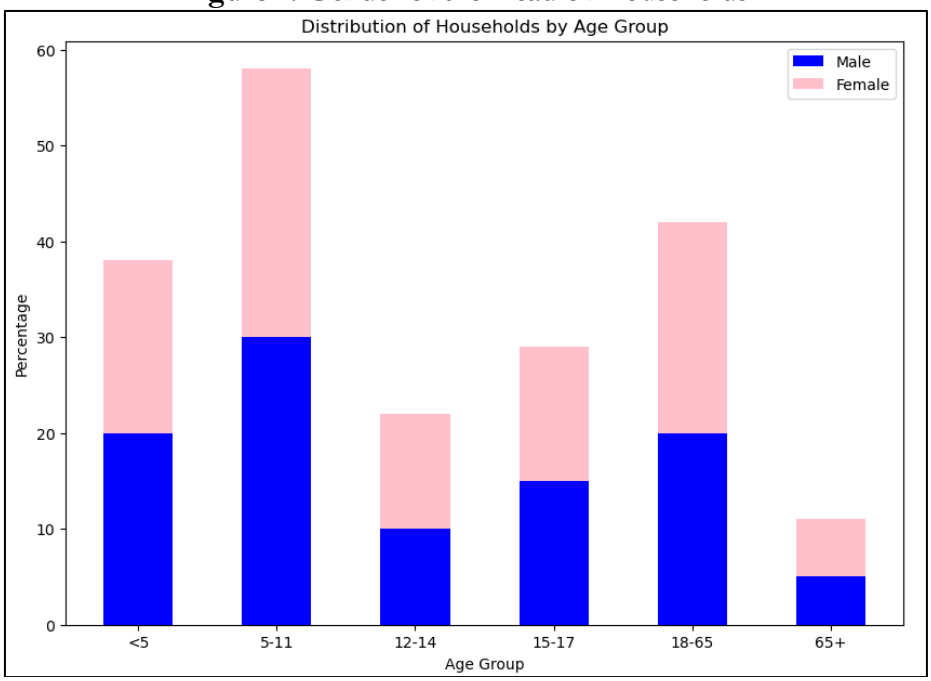

Figure 2: Distribution of Households by Age Group

Age Distribution:

The age distribution of household members shows a slight majority of females over males. Out of 733 family members, 354 (48.3%) were male and 379 (51.7%) were female. The majority of the population falls within the 18-to-65-year age group (57.3% males and 54.4% females), indicating a predominantly adult household population. Children aged 5 to 11 years were the most common, representing 14.9% of the total, while the elderly population above 65 years was 2.3%.

Marital Status:

The majority of both male (57.6%) and female (56.8%) household members were married. This uniformity in marital status indicates stable family units in the surveyed population.

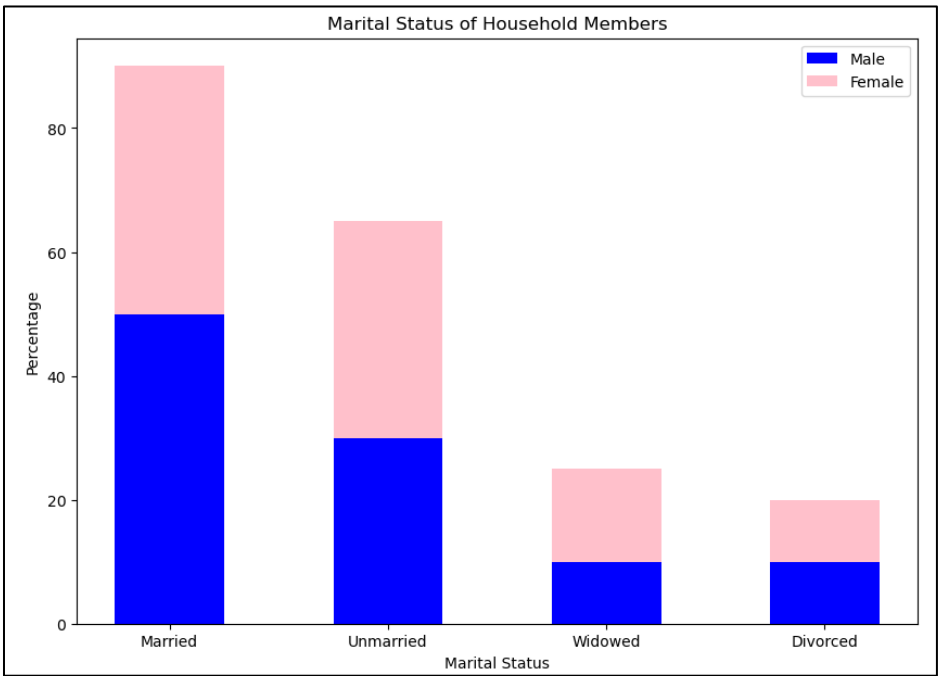

Figure 3: Marital Status of Household Members

Employment and Economic Activities:

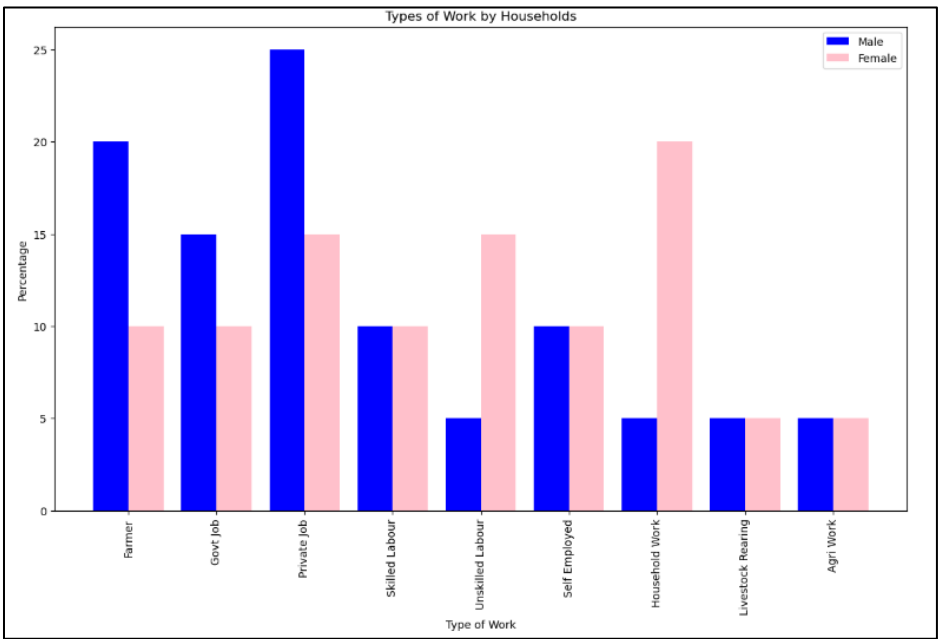

Figure 4. Types of Work by Households

Gender Roles in Employment:

The data indicates significant gender disparities in employment. The primary occupation for 69.1% of females was household work, whereas 30.1% were involved in agricultural work. Males were more diversified in their roles, with 36% engaged in agricultural work and 28.8% in farming.

Education Status:

Education levels reveal a significant gender gap, particularly in older age groups. Among males, 92% above 17 years were illiterate, compared to 96.2% of females. Education levels for children aged 5-11 show that 30% of males and 16.3% of females were illiterate, highlighting early educational disparities.

Income-Generating Activities:

Income-generating activities for women were limited, with most engaged in agriculture labor or household work. For females above 17 years, the predominant income-generating activities included household work (52%) and agricultural labor (15.4%).

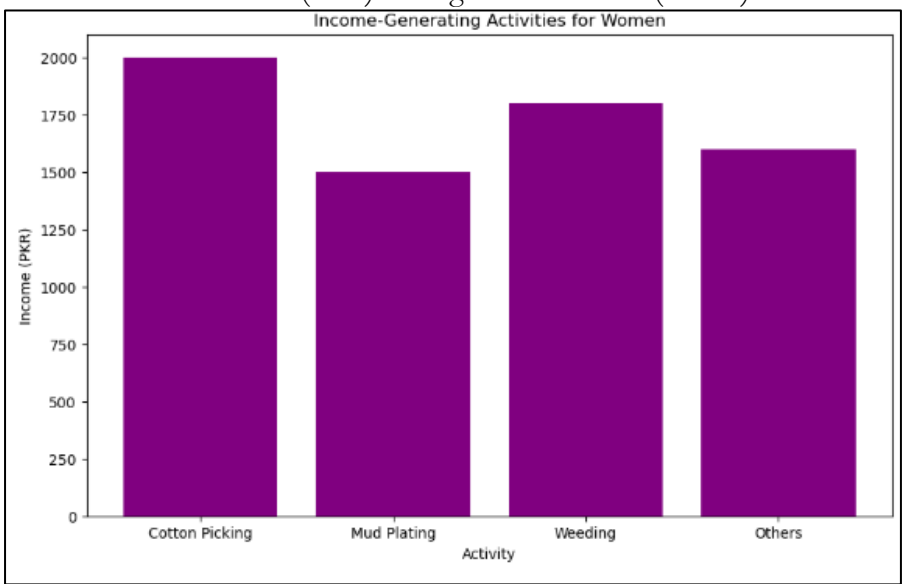

Figure 5: Income-Generating Activities for Women

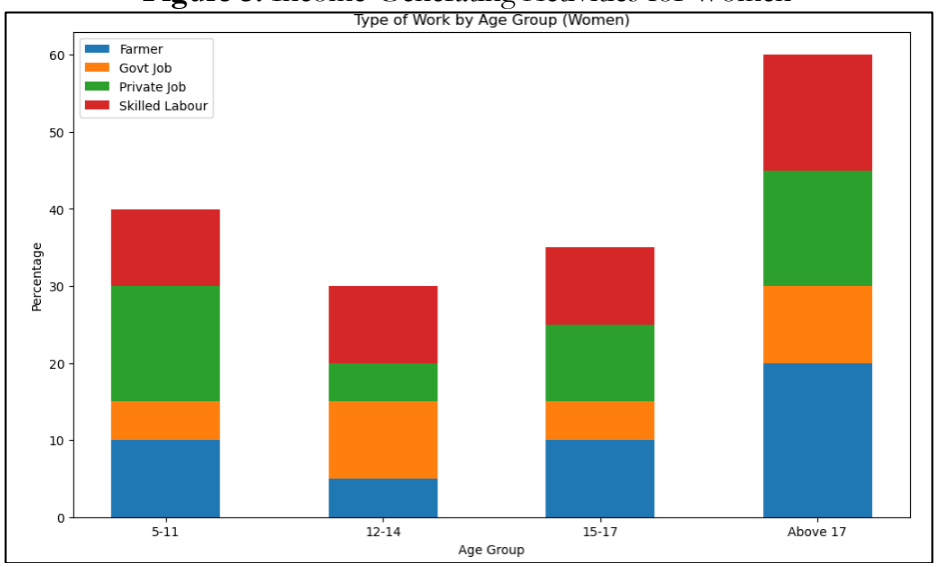

Figure 6: Type of Work by Age Group (Women)

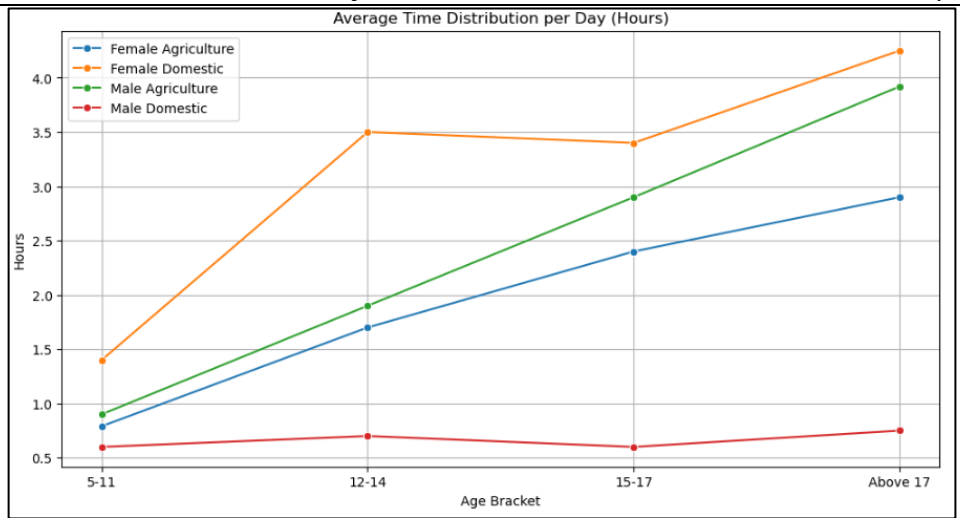

Figure 7: Average time distribution per day.

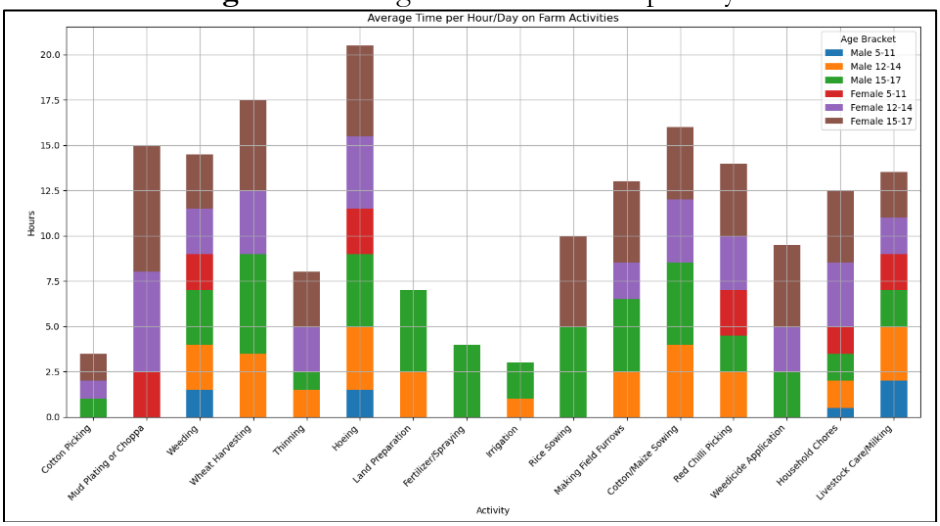

Figure 8: Average time per hour on farm activities.

Discussion:

The socio-economic profile of the surveyed households in Punjab reveals significant insights into gender roles, employment patterns, and educational disparities. The predominance of male-headed households (90.2%) underscores a traditional patriarchal structure in the surveyed population. This male dominance in household headship reflects entrenched gender norms that allocate decision-making and economic responsibilities predominantly to men. The small proportion of female-headed households (9.8%) indicates that women have less control over household resources and may face additional challenges in accessing economic and social support systems [13].

The age distribution shows a slight majority of females over males and a predominantly adult population. The majority of household members fall within the working-age group (18-65 years), with a notable proportion of children (14.9% aged 5-11 years). This demographic distribution is significant for understanding labor dynamics and economic contributions of different age groups [14]. The uniformity in marital status among both males (57.6%) and females (56.8%) suggests that most individuals are in stable family units. This stability might influence the continuity of traditional gender roles and responsibilities within households [15].

The data highlights stark gender disparities in employment. Women's primary engagement in household work (69.1%) compared to men's more diversified roles indicates a

gendered division of labor, where women are largely confined to domestic tasks. Despite a considerable proportion of women participating in agricultural work (30.1%), their roles are limited compared to men, who are engaged in a broader range of economic activities. Educational disparities are apparent, with a significant percentage of both males (92%) and females (96.2%) over 17 years being illiterate. These educational gaps are echoed in younger age groups, where 30% of boys and 16.3% of girls aged 5-11 are illiterate. Such disparities reflect systemic barriers to education, particularly for girls, which can perpetuate cycles of limited economic opportunity and social mobility [16] [17] [18].

Income-generating activities also reveal a gender divide. Women's involvement in agriculture and household work as primary sources of income (52% and 15.4% respectively) points to restricted economic opportunities. The lack of diversification in women's income-generating activities further highlights economic dependence on traditional roles and suggests a need for greater access to alternative livelihood options. The involvement of children in agricultural and household tasks from a young age underscores the socio-economic pressures faced by rural families. This early engagement in labor can impede educational attainment and perpetuate cycles of poverty. Addressing child labor requires targeted interventions to improve educational access and reduce economic reliance on child labor [19] [20].

The analysis of the surveyed households in Punjab reveals a traditional gendered structure with significant disparities in education, employment, and economic activities. The predominance of male-headed households and the gender-specific division of labor highlight entrenched norms that limit women's economic participation and educational advancement. These findings point to the need for targeted policies and interventions to address educational inequalities, particularly for girls, and to improve economic opportunities for women. Strategies to reduce child labor and promote access to quality education and alternative livelihoods are essential to foster equitable socio-economic development in rural communities. Efforts to challenge traditional gender roles, enhance educational access, and expand economic opportunities for women and children can help break the cycle of poverty and contribute to more balanced and inclusive socio-economic growth [21].

Conclusion:

The analysis highlights the traditional gender roles and economic responsibilities within farming households in Punjab. Male-headed households dominate, with gender disparities evident in educational attainment, employment types, and income-generating activities. Women primarily engage in household chores and agriculture, while children contribute to these tasks from a young age, reflecting the broader socio-economic pressures on rural families. These findings underscore the need for targeted interventions to address educational inequalities and improve economic opportunities for women and children in agricultural communities.

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