ISSN 0976-3120

Journal of Agricultural Extension Management

Vol. XXI January - June 2020 No.1

National Institute of Agricultural Extension Management
Hyderabad, India
www.manage.gov.in

Journal of Agricultural Extension Management is a half-yearly journal published by the National Institute of Agricultural Extension Management (MANAGE), Hyderabad. The Journal aims at disseminating information relating to extension systems and practices, research on extension, efficient organization of technology transfer and other socio-economic issues concerning agriculture and allied areas.

MANAGE welcomes articles representing original research in the field of agricultural extension and allied sectors, new developments, concepts and their application in effective extension work for publication in the Journal. Contributions and editorial correspondence may be sent to jaem@manage.gov.in

Subscription

- Individual Annual Subscription : Rs. 300/-
- Institutional Annual Subscription : Rs. 600/-
- Individual Life Membership : Rs. 3000/-
- Institutional Life Membership : Rs. 6000/-

Subscription amount may be sent to Chief Editor / Editor through D.D. drawn in favour of MANAGE, Hyderabad payable at Hyderabad.

JOURNAL OF AGRICULTURAL EXTENSION MANAGEMENT

Vol. XXI January - June 2020 No. 1

National Institute of Agricultural Extension Management
Hyderabad

Views expressed in the articles are of the authors and not necessarily of the Institute.

- Editor

JOURNAL OF AGRICULTURAL EXTENSION MANAGEMENT

Vol. XXI January - June 2020 No. 1

CONTENT

Determinantes of Rural Youth Unemployment in Northwest Ethiopia

Yitateku Adugna Agemas[1] and Beneberu Assefa Wondimagegnhu[2]

Abstract

Youth unemployment is one of the serious challenges facing Ethiopia. It has createdseveral economic and social crises in the country. The problem is high in rural areas in general andthe Yilmanadensadistrict in particular. However, the determinants of youth unemployment in the district are not yet assessed. In light of this problem, the main objective of this study is to identify and examine the determinants of youth unemployment. To realize the specified objective, primary and secondary data sources were used. Primary data were collected employing focus group discussions and semi-structured questionnairesgathered from 197 youths randomly selected in 3villages/kebeles of Yilmanadensa district.Descriptive statistics,chi-square tests, and binary logistic regression were used to analyze data. The study found that 30.96% of the respondents were unemployed while 69.04% of them were employed at the time of the survey. The binary logit model results show that variables such as work experience, skill mismatch, household income, infrastructure, social network, membership toa cooperative and eligibility of the youth for funding were identified as positively and significantlyinfluence the employment status of the rural youth.On the contrary, access to saving and credit services were found to negatively and significantlyinfluence the rural youth employment in Yilmanadensa district. The findings show that the government and other development stakeholders shouldbuild the capacity ofthe rural youth to make them competent in the labor market. They should also address the problem of infrastructures such as access to road, electric power and vocational schools to improve the skill of the rural youth and strengthen their social networks.

Keywords: Youth, Unemployment, Rural Youth Unemployment, Ethiopia

---

[1] Lecturer, Department of Rural Development and Agricultural Extension, Mekdela Amba University, Ethiopia
Corresponding Author Email : yitu2009adugna@gmail.com

[2] Associate Professor, Department of Rural Development and Agricultural Extension, Bahir Dar University, Ethiopia

Received Date: 22-11-2019 Accepted Date: 23-02-2021

Introduction

Youth are driving forces of social, economic and political development in all countries, and the ability of the youth to engage in development activities has an influence on the economy (Nganwa, et al 2015). Countries, organizations, nations, NGOs and civic affiliations have different age categorizationsfordefining the youth based on several factors. For example in Ghana, Tanzania, and South Africa age is defined between 15 and 35 years whereas Nigeria and Swaziland define it between 12 and 30 years. Botswana defines it between 14 and 25 years (Gyimah-brempong and Kimenyi, 2013). The United Nations (UN) and WHO defines the age of the youth as between 15 to 24 and 10 to 24, respectively. In Ethiopia, the age of youth lies between 15 to 29 years(MYSC, 2004). This has historically been used to capture the duration of transition between formative years and complete maturity. One factor of this transition concerns the movement from education to employment (ILO, 2017).

Unemployment is one of the major challenges facing today's world (Geest, 2010). Unemployed young people are defined as individuals seeking whether full time or part-time employment and available to start work (Skattebol et al., 2015).

The latest ILO estimates put the global youth unemployment rate for 2016 at 13.0 %, just below the crisis top of 13.1 % in 2011 and 2010. However, rising again to 13.1 % in 2017 and 2018. In developing countries, the unemployment rate among youth is expected to remain stable at 9.5 percent in 2017, while in emerging countries it is expected to rise to 13.8 %. The youth unemployment rate is predicted to fall in developed countries, declining from 14.0 % in 2016 to 13.4 % in 2017(ILO, 2017).

In Ethiopia, the unemployed population in the country is 1,981,165 with an unemployment rate of 4.5 %. This means nearly 5 persons are unemployed out of 100 economically active persons (CSA, 2014).In Ethiopia, several factors contribute to causes of youth unemployment such as negative financial performance, low education level, low entrepreneurship,mismatch skill and low awareness among the youth (Nayak, 2014). In rural areas of Ethiopia, several negative effects of youth unemployment like starvation of the youth and their family, serious social problems, affect the country's economy and make youth vulnerable to prostitution, hopelessness in education and joining armed groups rebelling against the government. This has taken the country to the violent circle of civil war and instability (HiruyWubie, 2012).

Most studies done in the country focus more on urban youth unemployment.Therefore, the research contributes to identifying the determinants of rural youth unemployment takingYilmanadensa district ofNorthwest Ethiopia as a case study. The results provide information for designing relevant programs and strategies to reduce the problem of youth unemployment in the study area.

Materials and Methods

Description of the Study Area

The study was conducted in Yilmanadensa district, which is found in the Amhara region, Northwest Ethiopia. It is situated about 42 km from the regionalcity, Bahirdar. The district is bounded by 35 kebeles/villages.Agriculture is the backbone of the community's livelihoods in thedistrict, which is dominated by mixed farming (both cropsand livestock production). The area is suitable for production of improved and high market value crops.

Methods of Sampling and Data collection

The study used a cross-sectional study design. The target population consists of youth agedbetween 15 and 29 years at the time of the survey, and who reside in the district.Quantitative and qualitative data were collected from primary and secondary sources. The primary data was gathered through semi-structured questionnaires whereas secondary data werecollected from published and unpublished documents Probability and non-probability sampling techniques were used. At the first stage,Yilmanadensadistrict was purposely selected, and in the second stage, three kebeles were selected out of 35 kebeles/villages (i.e.Danbasho, Debrermewi, and Goshiye) purposely.This is because thedistrict youth officein 2018 reported that theses kebeles/villages have the highest youth unemployment rates. In the third stage, sample youth were selected from the sample kebeles using systematic random sampling technique from the total number of youth in the three villages.The total Population in three kebeles is 9560, whereas 5927 of them are the youth between 15-29 years. There are several approaches to determine the sample. This study applied the simplified formula provide by Yamane (1967) to determine the sample size.

The formula is given as: $n = \frac{N}{1+N(e)^2}$

Where n is the representative sample size, N is the total youth population, and e is the desired level of precision. For a 93% confidence level, the researchers have selected the representative sample of:

$$n = \frac{5927}{1+5927\left(0.07\right)^2} = 197$$

Moreover, the researchers applied the proportional probabilistic sampling technique and have selected 197 youths from Debremewikebele(73 respondents), from Danbashokebele(57) and 66 respondents from Goshiyekebele.

Method of Data Analysis

Descriptive and econometric analyses have been employed to meet the main objective of the study. Descriptive statistics, chi-square tests,and binary logit model were used as analysis methods.The logistic regression modelto identify the major determinants of rural youth unemploymentis explained: -

$$\text{Log}\frac{(\text{P (i)}}{1-\text{P (i)}} = \text{in (odds)} = \text{B0} + \text{B1X1} + \text{B2X2} + \text{B3X3} + \text{B4X4} + \cdots \text{BnXn} \qquad (1)$$

The corresponding multiplicative model for the odds is: -

$$\text{Log}\frac{(\text{P (i)}}{1-\text{P (i)}} = \text{expB0} + \text{B1X1} + \text{B2X2} + \text{B3X3} + \text{B4X4} + \cdots \ldots\ldots\ldots + \text{BnXn} \qquad (2)$$

Where P (i) is the probability that ith respondent is unemployed and (1-P (i)) is the probability that the ith respondent is employed at the time of the survey, Bi's are the regression coefficients and the Xi's are the set of independent variables influencing employment status. From the Bi's, the odds ratio is estimated as exp (B). And the choice of the Logit model has certain advantages like simplicity and ease of interpretation (Fernando, 2011).

Definition of variables, measurements, and hypothesis

The dependent variable is employment status and it is dichotomies or dummy variable: where it represents (0) when the rural youth is unemployed and (1) when the rural youth is employed. Based on the theoretical background and different empirical studies,the following variables are hypothesized to influence youth employment status in the study area.

Table 1: Summary of independent variables that potentially influence employment status

Variables	Description	Values/Categories	Expected sign
Sex	Sex of the respondent	0 = female and 1= male	+
Age	Age of the respondent	Continuous variable	+
Migrant status	Migrant status of the respondent	0= migrant 1= non-migrant	+
Marital status	Marital status of the respondent	0 = married and 1= otherwise	–
Work experience	Work experience of the respondents	0= no work experience 1= has work experience	+
Skill mismatch	The relationship between the skill the respondents have and the market need	0= skill mismatch 1= skill match	+
Household income	Monthly Level of income in the household of the respondent	0= <= 400 birr, 1= 401-800 birr, 2= 801-1500 birr, and 3= above 1500 birr.	+

Saving and credit service	Access to credit saving service for the respondents	0 = no access to credit 1 = has access to credit	+
Education	Educational category ranging from illiterate to higher education	0 = illiterate 1= primary education 2= secondary education 3= Higher education	+
Access of road	Access of road and electric power in respondent	0= no 1= have access	+
Social network	Availability of social network for the respondent	0 = no network 1 = ≤ person networks 2 = > 3 persons networks	+
Member of cooperative	Member of cooperative Respondents	0 = not 1= member	+
Eligible for funding	[1]Eligible for the government revolving fund	0 = if not eligible 1= if eligible for the fund	+

Results and Discussion

Results of Descriptive Statistics

In this study, respondents were asked about their employment status in the last 15 days prior to the survey date. The survey result shows that out of the 197 respondents, the majority of the respondents (69.04%) were employed. The rest of the respondents (30.96 percent) were found to be unemployed at the time of the survey.

[1] The Ethiopian government allocates revolving fund for the Ethiopian youth as indicated in the ountry's proclamation no. 995/2017, with an objective of the attaining the development goals of the country by encouraging the direct participation of the youth in the economic activities of the country.

Table 2: Characteristics and Employment Status of Respondents Based on Demographic Factors

No	Variable	Category	Unemployed		Employed		Total		chi-square
			No	%	No	%	No	%	(X2)
1	Sex	Female	13	21.31	41	30.15	54	27.41	1.6522
		Male	48	78.69	95	69.85	143	72.59	(0.199)
2	Age	15-19	32	52.46	28	20.59	60	30.46	21.4006***
		20-24	19	31.15	83	61.03	102	51.78	(0.000)
		25-29	10	16.39	25	18.38	35	17.77	
3	Marital Status	Married	7	11.48	47	34.56	54	27.41	11.2773***
		Un married	54	88.52	89	65.44	143	72.59	(0.001)
4	Migration status	Migrant	4	6.56	17	20.50	21	10.66	1.5616
		Non migrant	57	93.44	119	87.50	176	89.34	(0.211)

Source: own survey (2019)
***, **,* significant levels at 1%, 5%, and 10%, respectively P-values are in parenthesis

From the sample respondents, 72.59 % of them were males while the rest 27.41% of them were females (Table 2). Of the total respondents, 21.31% of females and 78.69% of males were unemployed. The unemployment rate for males and females respectively was 33.5% and 24.0%. The chi-square test indicates that there is nostatistically significant association between sex and employment status.

The other important demographic variable is age. As indicated in Table 2, 30.46%, 51.78%, and 17.77% of the respondents were aged between 15-19, 20-24, and 25-29, respectively. The unemployment rate for ages between 15-19, 20-24 and 25-29 were 53.33%, 18.62%, and 28.57%, respectively. The test of association between unemployed and employed respondents interms of age groups was found to be significant ($x2 = 21.4006$, $P < 0.01$).

In addition, 27.41% of the respondents were married but 72.5% were non-married.Out of the total unemployed respondents, 88.52% of them are non-married while only 11.48% of them were married (Table 2).The unemployment rate of married and non-married respondents was 12.96% and 37.76%, respectively. The test of association was found to be significant ($x2 = 11.2773$, $P < 0.01$).

The other important demographic variable is the migration status. Out of the total respondents, 10.66 % of them are migrant respondents and 89.34% of the respondents were non-migrants. Out of the total unemployed respondents, 93.44% of them are non-migrants while only 6.56% of them are migrant respondents (Table 2). The unemployment rate for migrants and non-migrant was 19% and 32.38%, respectively. However, the chi-square test results show the association between the groups is not statistically significant.

Table 3: Characteristics and Employment Status of Respondents Based on Socio-Economic Factor

Variable	Category	Unemployed		Employed		Total		chi-square
		No	%	No	%	No	%	(X2)
Education Level	Illiterate	20	32.79	28	20.59	48	24.37	11.8473
	Primary	27	44.26	43	31.62	70	35.53	(0.008)***
	Secondary	12	19.67	46	33.82	58	29.44	
	Higher educ	2	3.28	19	13.37	21	10.66	
Work Experience	No experience	48	78.7	30	22.59	78	39.59	56.4653
	have experience	13	21.3	106	77.94	119	60.41	(0.000)***
Skill Match	Mismatch	36	59.02	19	13.97	55	27.92	42.4612
	Match	25	40.98	117	86.03	142	72.08	(0.000)***
Social Network	No any	43	70.49	21	15.44	64	32.49	61.9236
	<=3persons	17	27.87	73	53.68	90	45.69	(0.000)***
	>3persons network	1	1.64	42	30.88	43	21.83	
Access to Credit and saving	No access	23	37.70	25	18.38	48	24.37	8.5317
	Has access	38	62.30	111	81.62	149	75.63	(0.003)***

Infra-structure	No access of road and electric power	40	65.57	41	30.15	80	41.12	21.830 (0.000)***
	Has access	21	34.43	95	69.85	116	58.88	
Household income	<=400 birr	51	83.61	25	18.38	76	38.58	77.7356
	400-800 birr	1	1.64	54	39.71	55	27.92	(0.000)***
	800-1500 birr	4	6.56	31	22.79	35	17.77	
	>1500 birr	5	8.20	26	19.12	31	15.74	
Member of Youth cooperative	No member	46	75.41	55	40.44	101	51.27	20.6111
	Member	15	24.59	81	59.56	96	48.73	(0.000)***
Eligible for revolving fund	Not eligible	60	98.36	75	55.15	135	68.53	36.4628
	Eligible	1	1.64	61	44.85	62	31.47	(0.000)***

Source: own survey (2019)
***, **,* significant levels at 1%, 5%, and 10%, respectively P-values are in parenthesis

Amongthe socio-economic factors, education is also one particular factor. As shown in Table 3, 24.37% of the respondents were illiterate, 35.53% have primary education, 29.44% in secondary education, and 10.66 % of the respondents were at higher education level. Out of the total unemployed respondents, 32.79%, 44.26%, 19.67%, and 3.28% of them were illiterate, in primary education, secondary education, and higher education, respectively. The unemployment rate of illiterate, primary education, secondary education, and higher education respectively was 41.6%, 38.57%, 20.6%, and 9.52%,respectively. The chi-square test confirmed that the association was statistically significant ($x2 = 11.8473$, $P < 0.01$).

Work experience was the other factor of youth employment status. As shown in Table 3, 39.59 % of the total respondents did not have any experience but 60.41 % were having experience. Out of the unemployed respondents, 78.7% of them are not experienced while only 21.3% of them have work experience before the survey date. The unemployment rate forrespondents with experience and no experienceare10.92% and 61.53%,

respectively. The test result also reveals the association was statistically significant (x2 = 56.4653, P <0.01).

Another important variable is the match between the skill they acquired and the demand in the market. From the total respondents, only 72.8% of them had the skill they have directly matched with what is demanded by the market, while 27.08 % of them believe the existence of skill mismatch. About 59.02% of the skill mismatch was found among the unemployed groups (Table 3). From the sample respondents, the unemployment rate for those respondents with skill mismatch was 65.45%.The test of association was found to be significant (x2 = 42.4612, P <0.01).

It is known that information plays a major role in any activity. As shown in Table 3, the level of networking with the employment status of the respondents was examined. Based on the survey, 32.49% of them replied that they have no network while 45.69% and 21.83% have <=3 and more than 3 number of networks which could potentially help them for job searching, respectively. Out of the total unemployed respondents, 70.49% had no network and 27.87%, and1.64% of the respondents have <=3 and above 3 networks, respectively. The unemployment rate for those without any network, with<=3 and above 3 networks was 67.18%, 18.88% and, 2.32%,respectively. The test of association result indicates the existence of a statistically significant association between employed and unemployed groups interms of a social network (x2= 61.9236, P <0.01).

In Table 3, the result also shows that only 75.63 % of the respondents have access to credit and saving services while 24.37% of them do not. Out of the total unemployed respondents, 37.70% had no access to credit and saving service, and 62.30 % of the respondents have access to credit and saving service. The unemployment rate of individuals from respondents without access to credit and saving services was 47.91% while respondents with access to credit and saving services were 25.5 %. The test result revealed the existence of association between the employment status groups interms of access to saving and credit services (x2 = 8.5317, P < 0.01). Similarly, 41.12% of the respondents had no access to road and electric power while 58.88% of them had access to road and electric power. From the total unemployed respondents, 65.57% of the respondents had no access to road and electric power, and 34.43% of access to road and electric power were unemployed (Table 3). The unemployment rate for not access to road and electric

power and access to road and electric power respectively was 81.38% and18.10%. The test of association result indicates the existence of a statistically significant association between infrastructure and youth employment status (x2= 21.830, P<0.01).

From the total respondents, 38.58 % of them replied that their families' monthly income is <=400 birr, whereas 27.92%, 17.77% and15.74% of them had a household income ranging from 500-800,900-1500 and above 1500 birr, respectively. From the total unemployed respondents, 83.61%, 1.64%, 6.56%, and 8.20% of them had a household monthly income of <=400, 400-800, 800-1500, and >1500, respectively (Table 3). The chi-square test exhibited a significant association between household income and youth employment status at (x2 = 77.7356, P < 0.01).

Another important variable is the membership of the youth cooperative. From the total respondents, 51.27 % of them were not members of the youth cooperative, while 48.73 % of them were members. And also 75.41% of the unemployed respondents were not members of the youth cooperatives.(Table 3). From the sample respondents, the unemployment rate for those who are not members of the youth cooperative was 45.5%.The test result indicates the existence of a statistically significant association between employed and unemployed groups interms of membership to youth cooperatives (x2= 20.6111, P <0.01).

Moreover, about 68.53% of the total respondents were not eligible for a government revolving fund, while 31.47% of them were eligible for the fund. Besides, 98.36% of unemployed respondents were not eligible for funding depicting that only 1.64% of them were eligible for the fund (Table 3). From the sample respondents, the unemployment rate for individuals who were not eligible was 44.4% while those eligible for funds was1.61%. The test of association revealed the existence of association between employed and unemployed groups interms of their eligibility for fund (x2 = 36.4628, P < 0.01)

Determinants Influencing Rural Youth Unemployment

In this section, attempts have been made in explaining the determinants of rural youth unemployment employing the logit model.

In the model, a total of 13 variables that could potentially affect the rural youth unemployment was considered. Among them, 9 of the variables were found to be significant variables that affect rural youth unemployment. Hence, the relationship and the magnitude of influence of significant variables are analyzed below.

Table 4 Output for the Logistic Regression Model

Variables	Coef.	Odds ratio	Robust Std.err	Z	p>z	(95%conf. Interval)	
Sex	.1938031	1.213857	1.071923	0.22	0.826	.2150282	6.852355
Age	.3322282	1.394071	.8200524	0.56	0.572	.4401205	4.415686
Migration status	-2.892309	0.55448	.0954772	-1.68	0.093*	.0018975	1.620277
Marital status	-1.883412	0.1520703	.1763896	-1.62	0.104	.0156573	1.476969
Education	.1907906	1.210206	.3787497	0.61	0.542	.6553337	2.234878
Work experience	2.150963	8.59313	5.877944	3.14	0.002***	2.248565	3283956
Skill match	2.95333	19.16969	20.96785	2.70	0.007***	2.246822	163.5541
Household income	.9782775	2.659871	.9923373	2.62	0.009***	1.280255	5.526173
Saving and credit service	-1.829856	0.1604367	.1748297	-1.68	0.093*	.0189557	1.3579
Infrastructure	2.107535	8.227938	6.138891	2.82	0.005***	1.906368	3551201
Net work	2.263537	9.617046	6.536979	3.33	0.001***	2.537791	36.44413
Member of cooperative	1.689989	5.419422	4.481046	2.04	0.041**	1.071859	27.40113
Eligible for fund	2.749548	15.63556	16.07012	2.68	0.007***	2.085712	117.2121
Constant	-2.186636	.1122938	.1488337	-1.65	0.099	.0083594	1.508462

Number of obs =197
Wald chi2 (14) =73.77 likelihood = -34.117274 Prob> chi2 =0.0000
Pseudo R2 = 0.7201
Source: own survey (2019) ***, **,* significant levels at 1%, 5%, and 10%, respectively

Migration status

As was hypothesized, the migration status of individuals affects their employment status negatively and significantly. The odds of being unemployed for individuals who are migrants were 0.55 times lower than those individuals who are non-migrants (Table 4). The study found thatthe youth who came from different areas (those who were not originally from the area) reduced the challenge of unemployment. It seems that migrants may have better opportunities to gain more experience from other areas such as on how to diversify their livelihood, whichcontributes to improving their employment status. On the contrary, non-migrants, particularly from rural areas who had low levels of training and weak social networks, experience higher risk of being unemployed.

Work experience

In line with the hypothesis, work experience positively affects employment status at a 1% significance level. These results indicate that the odds of being unemployed increase by 8.59 times if the individual has no work experience than those with experience (Table 4). This might be because employers are usually not interested to hire young people who have little or no practical work experience. The result is consistent with the results of DejeneTerefe, et al., (2016).

Skill mismatch

It is supposed that a mismatch between the skills acquired and what is demanded in the labor market would keep the youth without a job. As shown in Table 4, skill mismatch and employment status are positively associated at a 1% significance level. The odds ratio of being unemployed increases by 19.17 times if the individual's skill and the demand by the market did not match. Itwas found that skill mismatch and unemployment have positive and significant associations.

Household income

Household income was alsofound to influence the employment status of youth in the study area positively and significantly. The odds of being unemployed for those individuals who lived in a household monthly income of<=400 Birr were 2.66 times higher than a household earning monthly income of 500-800 Birr, 900-1500 Birr and above 1500 Birr (Table 4).

This might be linked with the fact that individuals who have higher household income ould get a start-up capital to start their own business and thus get employment. The result was in line with the findings from DejeneTerefe et al., (2016).

Access to credit and saving services

Access to saving and credit services has a significant effect on the chance of employment. The chance of being unemployed for those who had no access to saving and credit services was 0.16 times lower than those who had access to saving and credit services. The relationship was negative and significant at a 10% significance level (Table 4).

Road and electric power

The chance of being unemployed for those who had no access to road and electric power was 8.23 times higher than those who had access to road and electric power. The relationship was found to be positive and significant at a 1% significance level (Table 4). Individuals who are fartherfrom road and electric power access incurhigher business risk and cost, which is a challenge for job creation, access to inputs andcomplexity to develop market chain and information. The finding is in line with Abshoko(2016).

Social network

Individuals who do not exploit personal networks could miss job opportunities available through personal networks. As indicated in Table 4, the odds of being unemployed increase by 9.62 times if individuals have no network compared to those individuals who have <= 3 and more than 3 networks, who could help them in finding a job. The relationship was positive and significant at a 1% significance level. The findings of this study confirm that the youth who have a deficitin social networks increase the probability of unemployment as having a better social network could make individualsaccess more information about job opportunities. Various studies confirmed on the necessities of building social networks in improving and creating job opportunities and minimizing unemployment (Abshoko, 2016), (Asalfew, 2011), (BachaBerhanu, 2014) & (MulugetaSefinew, 2013).

Member of Youth cooperatives

Member of youth cooperative is found to influence the employment status of youth in the study area with a positive and significant relationship. The odds of being unemployed increases by 5.42 times for those young individuals who are not members of the youth cooperatives than those who are members (Table 4). Those individuals who are not members of the cooperativeshave fewer opportunities to communicate and share experience with other members, whichcould potentially help them to work together and disuss ideas on creating jobs with friends.

Eligibility for government revolving fund

In the study area, the governmentallocatesrevolving budget to minimize youth unemployment.The results show that the odds of being unemployed increase by 15.64 times if individuals are not eligible for the fund compared to the youth who are eligible for the fund. The study implies that respondents who did not meetthe eligibility criteria for the fund such as inability to organize in a group or set to collateralcould not take the fund. This implies that the youths who are not eligible or qualified for the revolving fund contribute tounemployment. The revolving fund has lower interest rate and longer repayment periods than other credit sources, that creates a conducive environment for the youth to start-up their own business.

Conclusion and Recommendations

The study found that the problem of youth unemployment is determined by diverse socio-economic and demographic factors. The result indicates that the factors determining in Yilmanadensa district youth unemployment are, members of cooperative, work experience, skill mismatch, household income, access of road and electric power, social network and eligible for revolving fund. Generally, the socio-economic factor reduces the chance of employment opportunities of the rural young people in rural areas.

Based on the findings of the study, the following points are recommended to decrease the unemployment of young people in rural areas. The government and concerned bodies should

* motivate or improve rural youths to organize themselves in different groups or cooperatives and improve their social network:

* enhancecapacity building programs to improve the match between the skill of rural youth and current employment opportunities.

* improve access and quality of road and electric power in rural areas.

* strengththe youth association and increase the availability of initial working capital

* identify profitable business areas and the provision of practical training for rural youths to enhance their engagement and participation in non-farm activities.

Acknowledgment

The authors would like to thank all the respondents in Yilamadensa district and local officials for their willingness to provide the necessary information

References

Abshoko, D. A. (2016). Determinants of Youth Unemployment; Evidence from Ethiopia, 16(4), 66-75. Global Journal of Human-Social Sciencehttps://doi.org/10.11648/j.hss.20160403.11

Asalfew, Abera. (2011). Demographic and Socio-Economic Determinants of Youth Unemployment in Debere Birhan town, North Showa Zone, Amhara National Regional State.Journal of Strategic Studies. https://doi.org/10.1080/01402390.2011.569130

Bacha Berhanu, W. (2014). Socio-Economic Determinants Of Youth Unemployment In Jimma Town, Jimma Administrative Zone, Oromia National Regional State.MSC thesis, Jimma University, Ethiopia

CSA. (2014). The Federal democratic republic of Ethiopia. Central Statistical Agency, key findings on the 2013 national labour force survey. Addis Ababa, Ethiopia

DejeneTerefe Fila, J.Paul Mansingh, and WarkawLegese. (2016). Determinants of youth unemployment: The Case of Ambo Town International Journal of Economics and Business Management, Oromia, Ethiopia.Munich Personal RePEc Archive, Online athttps://mpra.ub.uni-muenchen.de/23698pp162-169.

Geest, K. van der. (2010). Rural youth employment in developing countries.Food and Agriculture Organization of the United Nations (FAO), Rome Italy.

Gyimah-brempong, K., & Kimenyi, M. S. (2013). Youth Policy and the future of African development. African growth initiative at Brookings.Working paper 9

Hiruy Wubie (2012). Youth unemployment in Ethiopia. An overview, www.adapt.it

ILO. (2017). Global employment trends for youth. Paths to a better working future Global Employment Trends for Youth.Paths to a better working future, International Labour Office, Geneva

Mulugeta Sefinew Negatu. (2013). A Study On Challenges And Prospects Of Youth's Job- Creation Initiatives in the Amhara Region:The Case of Selected Districts of the North Shewa Zone,M.Sc thesis, Indira Gandhi National Open University, School of Social Work

MYSC. (2004). Ethiopian youth policy, EthiopianMinistry of youth, sports & culture, Addis Ababa, Ethiopia

Nayak, B. K. (2014). Unemployment in Ethiopia: A Call for an Action.IJMSSR (International Journal of Management and Social Sciences Research, 3(4): 34-40.

Nganwa, P., Deribe Assefa, & Mbaka, P. (2015). The nature and determinants of urban youth unemployment, Public policy and Administration Research5(3).

Skattebol, J., Hll, T., Griffiths, Andrew, Wong, & Melissa. (2015). Unpacking Youth Unemployment Final report. CITI Foundation, UNSW Australia,social policy research center.

Yamane, T. (1967). Statistics: An introductory analysis (2nd ed.). New York: Harper and Row

Influence of Selected Factors on Participation of Rural Youth in Agriculture in Balaka District, Malawi

Alfred D. B. Tsitsi[1], Justus M. Ombati[2], Stephen W. Maina[3]

Abstract

Rural youths are facing challenges in earning a livelihood in Malawi. Malawi economy, which is predominantly agricultural, though offers a lot of opportunities but still has seen only a limited participation of rural youths. Despite the Malawi government efforts to enhance youth participation in the agriculture sector through policy support, only few youths participate actively in the sector. This background prompted the study to determine the influence of selected factors on participation of rural youth in agriculture in Balaka District, Malawi. The cross-sectional survey design was employed. Proportionate stratified sampling technique was used to attain a sample size of 196 rural youth respondents and 4 key informants, which were interviewed using researcher administered questionnaire and key informant questionnaire. Multiple linear regression model was used to analyse data and draw inferences from the findings. The findings indicate a very weak participation of rural youth in agriculture. Factors which include: age, marital status, education level, occupation, access to land, access to markets and access to alternative jobs and income have significant influence on participation of rural youth in agriculture. Government of Malawi could consider introducing youth specific agricultural interventions; institute an agricultural development fund for rural youth and an agri-preneurial training facility. Malawi Extension and Advisory Services Strategy Paper could also include rural youth development in agriculture as one of its priority areas, with clear attainable strategies aimed at improving access to land, credit and markets. The strategies should be guided by demographic factors like age, education levels, marital status, and occupation.

Keywords: Rural Youth, Agricultural Development, Balaka District, Malawi

[1&2&3] Department of Agricultural Education & Extension, Faculty of Education and Community Studies, Egerton University, P.O. Box 536-20115, Njoro, Kenya.
Corresponding Author Email : tsitsialfred@gmail.com

Received Date: 01-02-2020 Accepted Date: 03-06-2020

Introduction

Background of the Study

Rural youth are the future of food security [Food and Agriculture Organization (FAO), Technical Centre for Agricultural and Rural Cooperation (CTA) and International Fund for Agricultural Development (IFAD), 2014]. Yet around the world, few young people only see a future for themselves in agriculture or rural areas. Young people and mainly the rural youth face many challenges in trying to earn a livelihood out of agriculture though it offers a lot of opportunities. Alliance for Green Revolution in Africa (AGRA, 2015) specifies limited access to arable land, credit, markets, and many other productive resources necessary for agriculture as major problems worldwide. Older farmers are less likely to adopt the new agricultural technologies, and ultimately feed the growing world population while sustainably utilizing the environment (Mapila, 2014). Hence, there's need to engage youth in agriculture. Youth participation all along the agricultural value chain is thus vital to the growth of the agriculture-based economies of most African countries(AGRA, 2015).

Africa is faced with the problem of inadequate involvement of rural youth in agricultural-based livelihoods (Anyidoho, Kayuni, Ndungu, Leavy, Sall , Tadele&Sumberg, 2012). IFAD (2011) attributes this to lack of lucrative incentives in smallholder subsistence farming in many third world countries. The low participation of rural youth in agricultural livelihoods raises concerns for the future of agriculture (Mapila, 2014).

The World Bank (2012) indicates that Malawi faces employment challenges, in particular for youth. The country's economic profile indicates that 74 percent of the total population are living in poverty. The youth in Malawi form more than 50 per cent of the country's population (Government of Malawi, 2013). According to FAO & National Smallholder Farmers' Association of Malawi (FAO & NASFAM, 2015),Malawi economy is predominantly agricultural, with about 84 percent of the population living in rural areas. The Malawi National Agriculture Policy (GoM, 2016) indicates that the agricultural sector generates over 80 percent of the export earnings and 30 percent of the Gross Domestic Product (GDP). The sector therefore provides investment opportunities for Malawi rural youth for their livelihoods.Malawi provides afascinating case since the youth form a large proportion of the country's population (Chinsinga&Chasukwa, 2012).

The country's agricultural sector is characterised by inadequate participation of the youth, who are seen to be the future for agriculture (Government of Malawi, 2016).Chinsinga and Chasukwa (2017); Kamchacha(2012); Mapila (2014) suggest inadequate involvement of the youth all along the agricultural value chain, with the majority participating in subsistence farming focusing on production for consumption only.Factors like perceptions, availability of investment opportunities, demographic and socio-economic characteristics are responsible for rural youth's participation in agricultural sector (FAO, 2014). Determinants for rural youth's participation in the agriculture sector in Malawi were not extensively studied and documented.While there is a lot of documentation on youth participation in agriculture, current studies have focused on their participation in relation to policies, with few focusing on the specific factors influencing their participation in agriculture, which this study sought to uncover.

Objectives of the Study

The study was guided by the following objectives:

i. To determine the level of rural youth participation in agriculture in Balaka District, Malawi.

ii. To determine the influence of demographic characteristics of the rural youth on their participation in agriculture in Balaka District, Malawi.

iii. To determine the influence of selected socio-economic factors on participation of rural youth in agriculture in Balaka District, Malawi.

Hypotheses of the Study

H01: There is no statistically significant influence of demographic characteristics on rural youth participation in agriculture in Balaka District, Malawi.

H02: There is no statistically significant influence of socio-economic factors on rural youth participation in agriculture in Balaka District, Malawi.

Research Methodology

Research Design

The study employed a cross-sectional survey design to achieve its objectives. This design was selected because it enabled the researcher to make comparisons at a single point in time.

Location of the Study

The study was carried out in Balaka District, located in the Southern Region of the Republic of Malawi. Malawi is part of the sub-Sahara of Africa, and is located in the south-eastern part of the continent. It is bordered in the north and east by Tanzania, to the east, south and southwest by Mozambique, and to the west by the nation of Zambia. The study area was chosen because the challenge of inadequate youth involvement along the agricultural value chain manifests itself in the District, where a majority of rural youth are not employed and face challenges in trying to earn a livelihood as outlined by Balaka District Council (2017). The District has vast untapped agricultural potential for rural youth.

Target Population

The study targeted151,567rural youths. The rural youths were sampled regardless of their involvement in agriculture. All young men and women within the age range of 15-35 years had an equal chance of being sampled for this study. According to the 2008 Malawi census (NSO, 2008), Balaka District youth population is projected at 151,567 by the year 2016; representing about 37.02% of the total projected population of the District in 2016. The same demographics were accessed during data collection. The target population was the same as the accessible population.

Sampling Procedure and Sample Size

Proportionate Stratified Random Sampling technique was used to sample the number of rural youth respondents. As proposed by Nassiuma (2000), the following formula was used to come up with appropriate sample size for the study.

$$n = \frac{NC^2}{C^2 + (N-1)e^2}$$

Where: n= the required sample size, N = the population within the study area, C= Coefficient of Variation = Standard error. Applying the formula:

$$n = \frac{151567 \times (0.28)^2}{(0.28)^2 + (151567-1)(0.02)^2)}$$

The required sample size was arrived at 196. Having determined the sample size, the number of rural youth respondents interviewed in each of the six Extension Planning Areas (EPAs)were sampled proportionately according to the youth population in the respective EPA. Table 1 outlines the sample size as drawn using the explained methodology.

Table 1: Sample Size by Youth Proportion

EPA	Youth Population	Proportion of youth sampled (%)	Proportionate Youth Sampled
Ulongwe	42,566	28	55
Bazale	43,877	29	57
Mpilisi	28,260	19	37
Phalula	11,345	7	14
Rivirivi	11,104	7	14
Utale	14,414	10	20
Totals	**151,567**	**100**	**196**

Source: Modified from BDC (2017)

Key informant questionnaires were also administered where a total of four key informants were interviewed. These included agricultural extension officers from the Extension Planning Areas. According to Balaka District Council (2017), Balaka District has a total number of fifty-four Agricultural Extension workers in the various EPAs. Applying this population

size of fifty-four to the formula proposed by Nassiuma (2000) at 28% coefficient of variation and 2% standard error, the sample size for the key informants was found to be four and was sampled using simple random sampling technique. The total sample size for this study was 200 respondents.

Instrumentation

The study used two instruments, a researcher administered questionnaire to collect primary data from the rural youth whereas key informant questionnaire was used to collect information from key informants as required to attainthe objectives.

Data Analysis

The collected data was analysed using both quantitative and qualitative methods. Quantitative analysis employed both descriptive and inferential statistics.The collected data was checked for accuracy, coded and entered using Statistical Package for Social Sciences (SPSS) version 22 and analysed to produce necessary frequency tables and percentages. Inferences were drawnusing multiple linear regression model.

An index for participation was developed for objective dealing with level of rural youth participation in agriculture in Balaka District, Malawi. The indicator items for participation were given a score of '1' each, indicating an equal weight of participation along the agricultural value chain. Although there are no firm rules for index scoring, practice tends to support the method that items be weighted equally unless there are compelling reasons for differential weighing (Babbie, 1989). The index therefore had a maximum possible score of '12' indicating strong participation, since the total indicators items were twelve; and a minimum possible score of '0' indicating no participation at all. The index was developed to further characterize level of participation into five distinct categories. A total possible score of '0' indicated 'no participation', a total possible score of '1 to 3' indicated 'very weak participation', a total possible score of '4 to 6' indicated 'weak participation', a total possible score of '7 to 9' indicated 'moderate participation', while a total possible score of '10 to 12' indicated strong participation. The categorical data was quantified to allow running of the multiple regression model as recommended by Babbie (1989).

The two Null hypotheses were tested (for objectives two and three)using multiple linear

regression model at 0.05 level of significance ($\alpha \leq 0.05$). The model was used to make inferences about the results from the demographic characteristics and socio-economic factors. An index for participation was also developed in these objectives where the participation indicators were collapsed into two scores of '1' to indicate participation and '0' to indicate no participation. In addition, thematic analysis was developed for analysing the qualitative data.

Results and Discussions

Level of Respondents' Participation in Agriculture

Three attributes of the rural youth respondents were considered. These include: participation or non-participation in agriculture and participation type. The results indicate that 56.6% of the respondents participated in agriculture as compared to 43.4% that do not participate in agriculture. Table 2 presents the summary of the results of distribution of respondents by participation in agriculture.

Table 2: Percentage of Respondents by Level of Participation in Agriculture (n=196)

Level of Participation	Total Possible Score	Frequency	Percent
Non-participation	0.00	85	43.4
Very weak participation	1.0-3.0	108	55.0
Weak Participation	4.0-6.0	3	1.6
Moderate participation	7.0-9.0	0	0.0
Strong participation	10.0-12.0	0	0.0
Total		**196**	**100.0**

The findings also indicate that participation of respondents in agriculture was very weak as 55% of the respondents had a total possible score of one to three types of participation. Only 1.6% was in the category of weak participation with a possible score of four to six types of participation. None of the rural youth respondents were in the categories of moderate and strong participation according to the index of participation. The very weak

levels of participation indicate inadequate involvement of rural youth in the agriculture sector as asserted by the Government of Malawi (2016) in the National Agriculture Policy.

Demographic Characteristics and Participation of Rural Youth in Agriculture

The demographic attributes that were of interest in this study were: sex, age, marital status, level of formal education and main occupation as presented in Table 3.

Table 3: Distribution of Respondents by Demographic Characteristics (n-196)

Demographic Variable	Distribution	
Sex	**Male**	**Female**
	55.60%	44.40%
Median Age	24	
Marital Status	**Single**	**Married**
	57.10%	42.90%
Mean number of years spent in school	10	
Main Occupation	**Farming**	**Other**
	44.40%	55.60%

Sex: The findings indicate that 55.6% of the respondents were male and 44.4% were female. The results can be attributed to gender roles among rural youth in Malawi where males are seen to take active roles in economic activities than females. As such for married youth, the males were likely to be the respondents as compared to the females. According to Mussa (2016), gender difference to the disadvantage of young women is apparent in economic activities, including agriculture, in Malawi

Age: The median age was found to be 24 years which is within majority age group. This age is mature enough to venture into agriculture and it should be seen as an asset to the sector. The District Youth Officer (DYO) had this to say:

"The youthful population in the District however, could be taken as an opportunity for the youth since they are energetic and can ably participate in the agriculture sector. There is therefore need to actively involve the rural youth in agriculture, if the country is to achieve notable strides in the development of the sector [KII, DYO 2017]."[1]

Marital status: Results indicate a higher percentage (57.1%) of single youth than married Youth. According to Kimaro, Towo and Moshi (2015), marital status is an important demographic that is well associated with rural youth participation in agriculture. Married rural youth are more likely to be involved in agriculture (Muhammad, Omotesho & Folola, 2009).

Level of Education: Education was regarded as an important demographic factor as it may influence participation of rural youth in agriculture. FAO (2007) suggests a positive association between education of youth and their participation in agriculture. Formal primary and secondary education can provide young people with basic numeracy and literacy, managerial and business skills, and introduce youth to agriculture (FAO, 2014).The results indicate 36.2% attained the Malawi Junior Certificate of Education (JCE) which indicates 10 years in schooling, 31.1% attained Malawi School Certificate of Education (MSCE) indicating 12 years in schooling. The mean number of years in school for the respondents was found to be 10.22, mode was 10.0 and median was 10.0. However, the results show that more than 65% have not attained the MSCE, which shows high rates in secondary school drop-out. According to FAO (2014), development challenges in rural areas could be solved by youth empowerment through education. Rural youth require basic understanding of agricultural technologies for them to effectively participate in the sector.

Occupation: The findings indicate that 44.4% of the respondents were engaged in farming as their main occupation. The other 30.1% were students who are still in school, while 25.5% were engaged in other activities as their means to livelihoods. Access to alternatives jobs and other income sources could negatively influence rural youth participation in agriculture (FAO, 2014). Those that are formally employed form a very small proportion of the respondents. This indicates that the majority of the respondents still depend on the sector for their livelihood.

[1] Key Informant Interviews, District Youth Officer, January 2017

Results of the Regression Analysis are Presented as shown in Table 4.

Table 4: Regression Model Summary of Demographic Characteristics

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.829[a]	.687	.679	.28065

a. Predictors: (Constant), Age, Sex, Marital status, Education level, Occupation

b. Dependent Variable: Participation in agriculture

The regression analysis results for the model indicate an adjusted R2 value of .679; this show that variance in a combination of age, sex, marital status, education level and, occupation explained 67.9% of the variation in participation of rural youth in agriculture. The regression coefficients of the models showing the Beta, and p values are presented in Table 5.

Table 5: Regression Coefficients for Demographic Characteristics

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	p
1(Constant)	.036	.221		-.165	.869
Age	.046	.005	.472	9.223	.000
Marital status	.269	.051	.270	5.283	.000
Education	.032	.012	.117	2.590	.010
Occupation	-.248	.028	-.409	-9.002	.000

The regression analysis from the model indicates that age had a positive and significant influence with β=0.472 and p=0.000 on participation of rural youth in agriculture in Balaka District, Malawi. Educational level also had positive and significant influence with β=0.117 and p=0.010. Marital status had a positive and significant influence with β= 0.270 and p=0.000. This means that the older the rural youth, the more likely they are to participate in agriculture; and more years spent in school would likely influence participation in agriculture among the rural youth. Nnadi and Akwiwu (2008) concluded that education exhibited positive significant relationship with Youths` Participation in Rural Agriculture.

The results further show that un-married rural youth are less likely to participate in agriculture as compared to married rural youth who are likely to be engaged.

The regression analysis also indicates that occupation had a negative and significant influence on rural youth participation in agriculture; with β= -0.409 and p=0.000. This indicates that rural youth with alternative jobs and income sources are less likely to participate in agriculture. The magnitude of the t-statistics therefore indicates that the most significant demographic factor influencing participation of rural youth in agriculture is age with t=9.223. Occupation was the second most significant factor negatively influencing participation with t= -9.002. Marital status was the third most significant factor indicating t=5.283. The least significant factor was educational level with t=2.590.

Libaisi, Marinda and Wakhungu (2012) observe that gender, marital status and education levels had a significant effect on rural youth's participation in agricultural enterprises. Age, education, marital status and occupation were significant factors influencing youth participation in agricultural activities in Imo state, Nigeria (Nnadi & Akwiwu, 2008). Chikezie, Omokore, Akpoko and Chikaire (2012) also site significant characteristics such as: age, gender, marital status and education as having influence on rural youth participation in agriculture.

Socio-Economic Factors and Rural Youth Participation in Agriculture

Five attributes of the rural youth respondents in the study area were considered important in relation to objective three. These included rural youths' access to: land, financial credit, markets, agricultural information; and alternate income sources in relation to participation or non-participation in agriculture. Results have been presented as highlighted in figure 1.

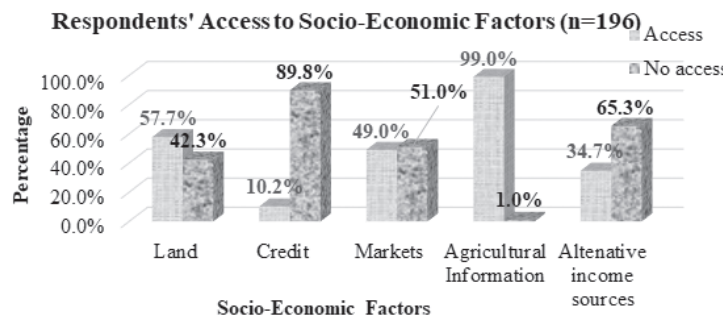


Figure 1: Percentage of Respondents with Access to Socio-Economic Factors

Access of the Youth to Land

The results indicate that 57.7% of the respondents had access to land while 42.3% did not. Respondents with access to land reported that the land was either family land or own land. Rural youth with no access to land however indicated that they were either still in school or were not yet married therefore their families had not yet allocated them their own land for farming. It is common in Malawian culture that children will be allocated land when they are independent in which case it could be through marriage or moving out of the parents' house to settle in own home. According to FAO (2014), access to land is particularly key for young people whose livelihoods depend on agriculture in rural areas. It is a pre-requisite for young people who want to venture into farming. The respondents' who do not have access to land cannot therefore be compelled to engage in the sector. The findings confirm that access to arable land for farming remains a principle challenge among rural youth in Malawi as asserted by FAO (2014); Kamchacha (2012; Kimaro et al., (2015).

The findings also reveal that ownership of land among rural youth is mainly in form of family land that has been passed on from parents. The findings also indicate growing pressure on land in Balaka District as asserted by key informants. This has been validated by this study as the mean land holding size was 0.87 hectares; mode and median were 0.61 hectares. Furthermore, the study found out that most of the land is customary and rural youth could not use it as collateral for accessing loans. Given that land is an essential production resource in agriculture, sustainable productivity for rural youth is highly unlikely.

Access of the Youth to Financial Credit

The findings indicate that access to credit is a key challenge with regards to rural youth participation in agriculture as 89.8% of the respondents were found to have no access to financial credit as compared to only 10.2% of the respondents who have access. This means that the respondents may not have adequate access to inputs for production and may not engage in market oriented farming since these require high capital investments. Access to financial services is fundamental to starting any agricultural activity (FAO, 2014). Lack of access to finance is a principle challenge faced by most young producers in Malawi (FAO & NASFAM, 2015). Valle (2014) observes that access to finance is a critical factor in developing self-employment opportunities for rural youth in agriculture.

Access of Youth to Agricultural Markets

The results, as highlighted in Figure1 indicate that 51.0% of the respondents had no access to markets. These findings could also explain the high percentages of respondents engaged in subsistence farming mainly for consumption. The results are in line with Government of Malawi (2016) which acknowledges that access to agricultural markets, especially among youth, remains a critical challenge in Malawi.

The respondents with access to markets are doing so through agricultural commodity traders commonly known as vendors. They also sell their produce at the local village market. This shows that rural youth in Balaka District do not necessarily have access to structured market platforms like contract marketing and agricultural commodity exchange. This is evidence that marketing is indeed one of the major constraints for rural youth participation in agriculture. Continued weak efforts towards notable policy interventions on agricultural marketing as observed by Chinsinga and Chasukwa (2017) could discourage this sizable and growing population from participating in agriculture.

Access of the Youth to Agricultural Information

The results indicate a stable agricultural information and extension system in Balaka District. This could be explained by the progressive demand driven extension system in Malawi. Modern day ICTs like radio and internet could also be responsible for the increased access to agricultural information. The education level of the respondents also plays a role in these findings given that a majority attended secondary school. The results are in agreement with Modernizing Extension and Advisory Services report (MEAS, 2012) which recognized the well-defined, decentralized, demand driven and pluralistic agricultural extension service delivery in Malawi. The history and current provisioning of agricultural extension services in Malawi is particularly rich (Kabuye &Mhango, 2006). According to Chowa, Garfoth and Cardey (2013), the Malawi agricultural extension policy is one of the most progressive public sector planning documents, incorporating the prominence of involving several service providers and a focus on responsiveness to farmer's felt needs.

Access of the Youth to Alternative Job Opportunities and other Income Sources

The results indicate that 34.7% of the rural youth respondents had access to other job opportunities and income sources. This means that strengthening youth participation in agricultural value chains could help provide more livelihoods options for the rural youth considering that 65.3% of the respondents do not have alternative income sources. The results agree with ILO (2012) that observe the seemingly lack of alternative jobs and other income sources for rural youth. Chinsinga and Chasukwa (2017) argue that while the government continues to pursue resolute efforts to address chronic youth unemployment, the problem persists because most of these efforts have been divorced from the agricultural sector. According to the respondents, low levels of professional education, family poverty, lack of capital and lack of skills are among the reasons for not having access to other income sources. FAO (2014) asserts that rural youth may not have the necessary skills or access to the necessary opportunities for skillset development and upgrade to participate in the green economy.

Table 6: Regression Model Summary of Socio-Economic Factors

Model	R	R Square	Adjusted R Square	Standard Error of the Estimate
1	.991[a]	.982	.981	.06841

a. Predictors: (Constant), access to: land, credit, markets, agricultural information and knowledge; and alternative jobs and income.

The regression analysis model from table 6 indicate an adjusted R2 value of .981; this indicates that variance in a combination of access to land, access to credit, access to markets, access to agricultural information and knowledge; and access to alternative jobs and income explained 98.1% of the variation in participation of rural youth in agriculture. The regression coefficients of the models showing the Beta, and pvalues are presented in Table 7.

Table 7: Regression Coefficients of Socio-Economic Factors

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	p
1 (Constant)	.029	.050		.590	.556
Land	.900	.022	.899	40.455	.000
Credit	.006	.017	.004	.349	.727
Market	.084	.021	.085	4.007	.000
Alt. jobs	-.029	.012	-.028	-2.403	.017

The regression analysis from the model indicates that access to land had a positive and significant influence with β =0.899 and p=0.000 on participation of rural youth in agriculture. Access to markets also had positive and significant influence with β=0.085 and p=0.000. This means that rural youth who have access to land and markets are more likely to participate in agriculture. The regression analysis also indicates that access to alternative jobs and other income sources had a negative and significant influence with β= -0.028 and p=0.017. This means that rural youth who have other income sources; are less likely to participate in agriculture as compared to those who depend on agriculture as their only means of livelihood.

The results of the regression analysis also indicate that access to credit had no significant influence with β=0.004 and p=0.727.This shows that access to credit does not compel rural youth to engage in agriculture. However, the study has established that it remains a challenge to youth engagement in agriculture. The magnitude of the t-statistics indicate that the most significant socio-economic factor is access to land with t=40.455. Access to markets was the second most significant factor with t=4.007. The least significant factor was access to alternative jobs and other income sources with t= -2.403, indicating negative influence.

Therefore, it is concluded that socio-economic factors have a significant influence on participation of rural youth in agriculture. The specific factors include access to land and access to markets that have positive significant influence; access to alternative jobs and

other income sources that had negative influence. The results concur with Chinsinga and Chasukwa (2012) who observe that rural youth's access to land is very critical as it is a significant determinant of their participation in agriculture. Access to lucrative markets is an important factor in participation of rural youth in agriculture (Mapila, 2014).

Conclusions

The following conclusions have been drawn from the study findings:

i. The level of rural youth participation in agriculture in Balaka Districtis very weak. While a majority of the rural youth is participating in agriculture, they are only engaged as primary producers mainly for consumption leaving out participation in other profitable activities along the agricultural value chain which could provide livelihood options for them.

ii. Demographic characteristics have a significant influence on participation of rural youth in agriculture in Balaka District, Malawi. Age, marital status and educational levelare more likely to positively influence participation of rural youth in agriculture.

iii. Socio-economic factors significantly influence participation of rural youth in agriculture in Balaka District, Malawi. Access to land and access to markets have positive influence on participation. Access to alternative jobs and other income sources negatively influence participation of rural youth in agriculture.

Recommendations

Based on the study findings, the following areas have been recommendedfor policy interventions and further research:

i. Ministry of Agriculture Irrigation and Water development should consider introducing youth specific market oriented agricultural interventions; focusing on profitable value chains, that aims at re-engaging and strengthening rural youth participation in the sector.

ii. The Government of Malawi should consider instituting a fund exclusively targeting rural youth as beneficiaries, championed by the youth themselves as partners; with the aim of enhancing access to financial credit and loans to enable rural youth acquire land and other production resources for meaningful commercial farming.

iii. The Government of Malawi should consider instituting an agri-preneurial training facility for this sizable and growing demographic.

iv. The Malawi Extension and Advisory Services Strategy Paper should include rural youth development in agriculture as one of its priority areas; with clear attainable strategies aimed at improving access to land, markets, credit and improved ICTs. The strategies should be guided by factors like age, education levels, marital status, and occupation.

v. Further research may be carried out to examine the capacity of District Agricultural Extension Services System (DAESS) to champion inclusion of rural youth in agriculture.

Acknowledgements

This work hinges upon the voluntary provision of information by the rural youth respondents and front line agricultural extension workers from Balaka District, Malawi. The authors are grateful for their unconditional participation in this study. This paper is also based upon work supported by the United States Agency for International Development, as part of the Feed the Future initiative, under the CGIAR Fund, award number BFS-G-11-00002, and the predecessor fund the Food Security and Crisis Mitigation II grant, award number EEM-G-00-04-00013. The authors are grateful to for the support. We also acknowledge all sources whose contribution helped shape up this paper.

References

Alliance for a Green Revolution in Africa (AGRA). (2015). Africa Agriculture Status Report: Youth in Agriculture in Sub-Saharan Africa Issue No. 3. Nairobi: Alliance for a Green Revolution in Africa (AGRA). Retrieved August 15, 2016, from https://agra.org/AGRAOld/wp-content/uploads/2016/04/africa-agriculture-status-report-2015.pdf

Anyidoho, N. A., Kayuni, H., Ndungu, J., Leavy, J., Sall, M., & Sumberg, J. (2012). Young People and Policy Narratives in Sub-Saharan Africa. FAC Working Paper 032. Brighton, UK: The Future Agricultures Consortium.

Babbie, E. (1989). The Practice of Social Research (5th ed.). Carlifonia: Wadsworth Publishing Company.

Balaka District Council. (2017). Balaka District Socio-Economic Profile. Balaka: Balaka District Council.

Chikezie, N. P., Omokore, D. F., Akpoko, J. G., & Chikaire, J. (2012). Factors Influencing Rural Youth Adoption of Cassava Recommended Production Practices in Onu-Imo Local Government Area of Imo State, Nigeria. Greener Journal of Agricultural Sciences, 259-268.

Chinsinga, B., & Chasukwa, M. (2012). Youth, Agriculture and Land Grabs in Malawi. Paper Prepared for the Conference Young People, Farming, and Food. Retrieved March 12th, 2017, from Future Agricultures: http://www.future-agricultures.org/.../1504-youth-agriculture-and-land-grabs-in-malawi

Chinsinga, B., & Chasukwa, M. (2017). Agriculture and Youth Unemployment in Malawi. Department of Political and Adminstrative Studies; Chancellor College. Zomba: Chacellor College. Retrieved December 21, 2017, from http://downloads.cc.ac.mw/doc/Policy_Brief_Vol_1_2.pdf

Chowa, C., Garfoth, C., & Cardey, C. (2013). Farmer Experience of Pluralistic Agricultural Extension, Malawi. The Journal of Agricultural Education and Extension, 19(2), 147-166.

Food and Agriculture Organisation of the United Nations/ National Smallholder Farmers' Association of Malawi. (2015). Rural Youth Employment Activities in Malawi: Assessment Report. Rome: FAO.

Food and Agriculture Organization of the United Nations/ Technical Centre for Agricultural and Rural Cooperation/ International Fund for Agricultural Development. (2014). Youth and Agriculture: Key Challenges and Concrete Solutions. Rome: FAO.

Glick, P., & Sahn, D. (2000). Schooling of Girls and Boys in a West African Country: The Effects of Parental Education, Income and HouseHold Structure. Economics of Education Review, 63-87.

Government of Malawi, Ministry of Agriculture, Irrigation and Water Developemnt. (2016). National Agriculture Policy. Lilongwe.

Government of Malawi, Ministry of Youth and Sports. (2013). National Youth Policy. Lilongwe. Retrieved March 20th, 2017, from youthpolicy.org: http://www.youthpolicy.org/national/Malawi_2013_National_Youth_Policy.pdf

International Fund for Agricultural Development (IFAD). (2011). Feeding Future Generations: Young Rural People Today-Prosperous, Productive Farmers Tomorrow. Retrieved March 12th, 2017, from ifad: https://www.ifad.org/documents/10180/feadfaf5-2f97-43fb-bf31-ad8e5a71549a

Kabuye, E. S., & A, M. J. (2006). A Brief History of Agricultural Extension Services in Malawi: An Outline of Organization, Policies, Systems and Methodologies. Lilongwe: Republic of Malawi; Department of Agricultural Extension Services.

Kamchacha, C. (2012). Current and Emerging Youth Policies and Initiatives and their Links to Agriculture: Malawi Case Study Draft Report. Pretoria: Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN).

Kimaro, P. J., Towo, N. N., & Moshi, B. H. (2015). Determinants of Rural Youth Participation in Agricultural Activities: The Case of Kahe East Ward in Moshi Rural District, Tanzania. International Journal of Economics, Commerce and Management, III(2), ISSN 2348 0386.

Libaisi, J. K., Marinda, P. A., & Wakhungu, J. W. (2012). Common Interest Youth Groups and Their Contribution to Food Security Among Small Holder Farm Households in Western Kenya. Retrieved June 4, 2016, from Future Agricultures: http://www.future-agricultures.org/publications/search-publications

Mapila, M. M. (2014). Agricultural Policy Processes and the Youth in Malawi: IFPRI Discussion Paper 01335. Retrieved March 12th, 2017, from IFPRI: http://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/128109/filename/128320.pdf

Modernizing Extension and Advisory Services (MEAS). (2012). Strengthening Pluralistic Agricultural Extension in Malawi. A MEAS rapid scoping mission. East Lansing: Michigan State University. Retrieved June 2, 2017, from http://pdf.usaid.gov/pdf_docs/pnady768.pdf

Muhammad, A., Omotesho, O. A., & Folola, A. (2009). Technical Efficiency of Youth Participation in Agriculture: A Case Study of the Youth in agriculture program in Ondo State, South western Nigeria. Nigerian Journal of Agriculture, Food and Environment, IV(1), 20-26.

Mussa, R. (2016). Labour Market Transitions of Young Women and Men in Malawi: Results of the 2014 School-to-Work Transition Survey. International Labor Organization. Geneva: ILO. Retrieved June 28, 2017, from http://www.ilo.org/wcmsp5/groups/public/---ed_emp/documents/publication/wcms_470713.pdf

Nassiuma, D. K. (2000). Survey sampling: Theory and Methods.Nairobi: University of Nairobi.

Nnadi, F. N., & Akwiwu, C. D. (2008). Determinants of Youths' Participation in Rural Agriculture in Imo State, Nigeria. Journal of Applied Sciences, 328-333.

Valle, F. D. (2014). Exploring Opportunities and Constraints for Young Agro Entrepreneurs in Africa: Conference Abridged Version. Rome: FAO.

World Bank. (2012). Poverty Headcount Ratio at $1.25 a Day (PPP). Retrieved March 19th, 2018, from World Bank: http://www.worldbank.org/en/country/malawi

Assessment of Farmers' Attitude and Experience on Indigenous Agroforestry Practices in Ethiopia: The Case of Dibate District, in the Benishangul Gumuz Regional State

Bilisuma Hailu Kuma[1]

Abstract

The study was conducted to document and analyse existing practices, farmers' experience and knowledge, opportunities and constraints of agroforestry by taking 105 farmers for formal interview, group discussion, field observation and informal interviews. Home gardens, shifting cultivation, alley cropping, windbreak and live fencing are among the main identified agroforestry practices including respective farmers experience and knowledge. The local farmers have remarkable knowledge on tree species preference based on its compatibility and adverse effects on the proximate crops, and its multipurpose use. The tree/shrub species preferred in agricultural lands are Acacia abyssinica, Erithyrina abyssinica, Erithyrina brucei, Piliostigma thonningii, Strychnos spinosa, Stereosperum kunthianum whereas Dichrostachys cinerea, Terminalia laxifolia, Combretum molle, Grewia ferruginea, Dombeya torrida, Strychnos spinosa, Piliostigma thonningii, bamboos, Vernonia amygdladina, Cordia africana, Ficus vastae and Ficus sur are the species preferred for animal feed. Farmers have positive attitude to practice agroforestry. However, water shortage, free grazing, infrastructures and drought are mentioned as the major constraints to practice it by 96.8, 91.4, 85.2 and 79.9 percent of the respondents respectively. Farmers' experience and knowledge about the use of multipurpose trees especially in improving agricultural lands was found to be considerably high. Every development strategies of agroforestry and related land use systems should integrate farmers' experience and knowledge.

Keywords: Farmer Participation, Agroforestry, Indegenous knlowledge, Ethiopia

---

[1] Instructor, Department of Natural Resource Management, College of Agricluture and Environmental Sciences, Bahir Dar University. Corresponding Author Email : bilisumahakuma@gmail.com

Received Date: 17-06-2020 Accepted Date: 30-07-2020

Introduction

For thousands of years, human beings, forest, and trees cohabited quite peacefully. However, in the recent centuries and decades, humankind has become a conquering predator, and the balances between human being, and trees and forest have been broken and lost, mainly due to over exploitation (1). This has led to loss of social, economic and environmental benefits of forest and woody vegetation. Adoption of sustainable agriculture is often proposed as a solution to these problems. Sustainable agriculture is concerned with agricultural practices that are economically viable, meet human needs for food, are environmentally friendly, and improve quality of life. As evidences across the world indicate, traditional agroforestry combination of trees, crops and animals is one of the major means of healing such problems.

An agroforestry practice usually denotes a specific land management operation of an agroforestry nature on a farm or other management unit, and usually consists of arrangement of agroforestry components (1). Commonly, these practices include the arrangement of components in space and time vise-a vise the major function of the tree component. Agroforestry is a dynamic, ecologically based natural resources management system that, through the integration of trees in farmland and rangeland, diversifies and sustains production for increased social, economic and environmental benefits for land users at all levels (2).

Several agroforestry systems have been recorded from different parts of the world. For example, I) park land agroforestry practice is found in a large part of the agricultural landscape under subsistence farming conditions in the tropics (as in Africa), which is characterized by dispersed trees (1). Kessler (3) reported that approximately 20 different tree species are common in these parklands; II) hedgerows and living fences are planted and managed as part of a crop or livestock operation to enhance crop production, protect crops and livestock, and/or control soil erosion; III) Alley cropping is also a practice of growing food crops between parallel hedgerows of (usually leguminous) shrubs and trees. The hedges are pruned periodically during the growing season to provide biomass and to prevent shading of the growing crops; IV) Homegardens are practiced near to dwelling places and are intensively managed by family labor (1).

Different management systems are manipulated by the farmers to achieve the desired objective within the agroforestry systems. In most cases, local knowledge plays important

role in management of crops, trees, livestock and soil in their production systems of the rural communities rather than the scientific knowledge (4). The integration of trees, agricultural crops, and/or animals into an agroforestry system has the potential to enhance soil fertility, reduce erosion, improve water quality, enhance biodiversity, increase aesthetics, and sequester carbon (5-7).

Several characteristics could be identified as desirable attributes for trees in agroforestry systems. But often it is not possible to choose trees with all these characteristics, either because other plants are already established, or because production or protection goals favor the choice of other species. Whenever a tree species with all the desired characteristics is not available (which is most likely to be the case), tree crowns and roots can be manipulated through management operations, mainly by pruning and thinning. For instance, management systems such as coppicing, pollarding, pruning, and thinning are identified as the major management practices in Southern Gondar, Ethiopia (8). Tree root pruning is a potential tool for managing belowground competition when trees and crops are grown together in agroforestry systems (9). The biophysical interaction between trees and crops strongly influences tree management practices and their structural and spatial assemblage (10).

The important contribution of local knowledge can make to scientific knowledge has been increasingly recognized as useful in providing a deeper insight into the interdisciplinary and site-specific characteristics of land use and natural resource management and the understanding of the interaction between agroecological systems and humans (11). Local knowledge can provide valuable information that can feed back synergistically to channel the direction of conventional science to meet the needs of local people (12). In many circumstances, interventions that build on local practice to improve land management practices will be more readily accepted by farmers than new technology.

Studies have recommended agroforestry as a potential alternative for land use practices in relation to the other land uses for Ethiopia (13; 14). Agroforestry offers a potential solution to the problem of declining rural agricultural production in the tropics (15). This need to undertake different research works to better understanding on various agroforestry systems that exist and be able to incorporate them into the activities of development planning.

However, different constraints such as theft, water shortage, transportation, population pressure, termites, etc. hinder the development of agroforestry practices in Ethiopia (8; 16). Identifying the constraints and opportunities for the agroforestry practices are important issue to enhance agroforestry development. Constraints and opportunities are different in different areas for the agroforestry practices. In the Brazilian Amazon socio-economic and political constraints such as markets, agro-industrial development, community organization at the local level, credit, and the regulatory and fiscal, land tenure, environmental and technical constraints such as technical knowledge and extension activities were constraints for agroforestry promotion (17).

In Dibate district of Metekel zone, agroforestry practices and related experiences have not been documented. Hence, existing practices and its local experience and knowledge should be recorded and documented to be right to use in development and future studies. Therefore, it is imperative to know about the existing agroforestry practices and how the farmers are managing it. This study is therefore, intended to bridge some of these knowledge gaps in Dibate district, Metekel zone of Benishangul Gumuz region, Ethiopia by documenting the agroforestry practices, experience and knowledge of the local communities related to it.

Objectives of the study

* To document and analyze existing agroforestry practices and its evolution.
* To assess and describe farmers' knowledge, experience and attitude on agroforestry practices
* To identify opportunities and constraints of the existing agroforestry practices in order to improve future management system.

Materials and Methods

Description of study area

Location

Dibate district is situated in Metekel zone, Benishangul-Gumuz regional state at 550 km from Addis Ababa capital city of Ethiopia and 1300 km from Assosa, regional capital (Figure 1). Dibate is located at latitude and longitude of $10^0$39'N, $36^0$13'E respectively with an elevation of 1438 meters above mean sea level. It is one of the 21 districts, in Benishangul-Gumuz Region of Ethiopia. It is part of the Metekel Zone, bordered by Mandura on the north, by the Dura River on the east which separates it from the Amhara Region, by the Abay River on the south which separates it from the Kamashi Zone which is the other zone of the region, and by Bullen district on the west.

Climate and Topography

The climatic condition of the area is characterized by mono-modal rainfall pattern with about average annual rainfall ranging from 800-1200 mm that rains from April/May to October/November (18). The temperature reaches a daily maximum of 20^0C to 25^0C during the rainy season and rises to 35^0C to 40oC during the dry season. The minimum temperature ranges from 12^0C to 20^0C, depending on season and altitude (19).

Map of Ethiopia

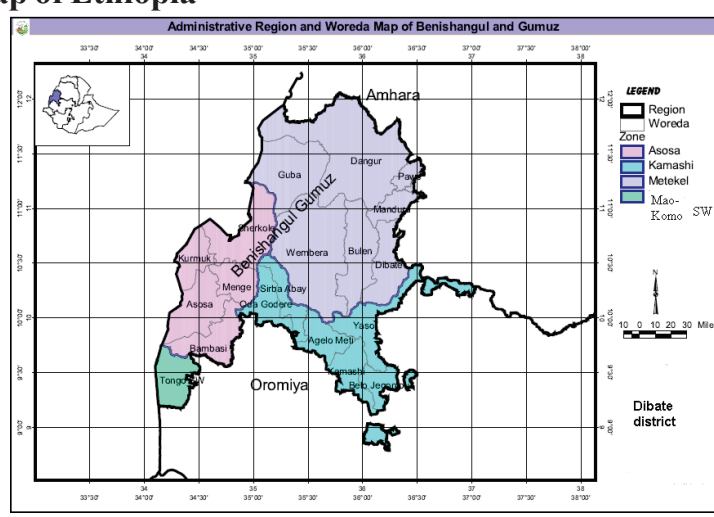


Figure 1: Location of Dibate district, Benishangul - Gumuz Regional State, Ethiopia

Demographics

Based on figures from the Central Statistical Agency's report of population and housing census (20) of Ethiopia, Dibate has an estimated total population of 66, 654. Out of this, 33,452 are men and 33,202 are women; 7,399 or 11.1% of the population are urban dwellers which are less than the Zone average of 13.7%. With an estimated area of 2,425.32 square kilometres, Dibate has a population density of 22.3 people per square kilometre, which is above the Zone average of 8.97 (20).

Economic activities

Rain fed, mixed and semi-subsistence farming system is the major economic activities of the area. Teff, sorghum, maize and millet are the dominantly grown cereal crops, groundnut and niger seed are the major cash crops cultivated in the area. The main income source of the area is selling the livestock (animals and animal products) and cultivated oil crops (niger seed and groundnut). In the area, there are trade activities by transacting animals, cereal and cash crops from the area where it is cheap to an area where it is with high value or keeping the crop or the animals until the price gets high.

Methods Employed

Preparatory phase

Before starting the main field work, discussions were held with the administrators of the district and local leaders to get permission to conduct the study in the area. Reconnaissance survey on the selected kebeles was conducted to get a firsthand understanding of farmers' practice, capture the greatest diversity or ecosystems, land use systems, socio-economic situation, and for planning of the survey.

Research site selection

Zone, district and kebele selection was purposively, based on dominantly existence of agroforestry practices (major criteria), and accessibility for transportation. Accordingly, out of the 29 kebeles found in the district two kebeles (Gallessa and Chancho) were selected. Finally, two villages from Gallessa (Gallessa and Jajabagissa-mandan) and three villages from Chancho (Gishigara, Geshie and Bishandida) were randomly selected for

the study. Due to high number of households per village only two villages were considered in Gallessa.

Sampling procedure

Key informant selection

Selection of key informants was necessary to discuss about the evolution of agroforestry. For each of the selected villages five key informants were selected by village tour. During village tour the farmers were randomly asked to list the name of five key informants (KIs). Of which the top frequently appeared five KIs were selected for group discussion at each village.

Focus group selection

Elders and youths group within each village were selected for focus group discussion. In this way two groups were formed in each village. The purpose of the group discussion was to get information how and where the local communities acquire knowledge in use and management of agroforestry practices.

Household selection

The household lists of each selected villages were collected from the offices of local administrators and development agents (DAs). Based on information from these offices, the following household (HH) figures were obtained, 1152 from Gallessa, 492 from Jajabagissa-mandan, 179 from Geshie, 156 from Gishigara and 167 from Bishandida. By simple random sampling technique with 5% sampling intensity 57, 24, 9, 7 and 8 totalling, 105 household respondents were respectively selected from each village. Perhaps, the sampled HH number is not representative of a zone or a region, but as financial limitation was a big problem, it is believed to be enough for analysis of the current information.

Data collection

Different approaches were used to generate the different information required for the study following the above selected techniques as shown below. Data of existing agroforestry practices, related management knowledge and experience were collected.

Primary data collection

Informal interview

Informal interviews with the selected key informants were carried out to get overview of the land use changes, evolution of agroforestry (AF) practices, local knowledge for managing AF systems, constraints and opportunities for development of agroforestry. Information collected at this level was used to develop and adjust questionnaires.

Household survey

Structured household interviews were conducted using the questionnaires. The interview was with the head of the household because it is believed that the head of the household would give much information on the household's affairs and activities of farm management.

Field observation

Visiting and observation through village to get an overview of existing AF practices, and management systems of the practices especially the tree components was conducted. Each farm land of the selected households has been observed well.

Group discussion

Group discussion among the selected groups in each village was carried out. In the group discussion, information on vegetation status of the area and problems for current land use practices, etc. were generated. During the discussions, care was taken from factors that will discourage active participation of individuals.

Data processing and analysis

First, the collected data were translated from the local language to English. Then the data were summarized, registered, cleaned, coded and analyzed with the help of statistical package for social science (SPSS version 16.0) and presented by tables, figures and percentages.

Results and Discussion

Socio-economic characteristics of the respondents

The age of the respondents was 31 and above. As it can be seen from Table 1 most of the respondents are 50-60 years age old. This implies that agroforestry practices are developed through experiences from what the farmers observe and understood throughout their life (trial and error) and environmental conditions. Except in Geshie, on average, most of the respondents in all villages could read and write and were in first and/or secondary cycles. This might have positive implication for positive relationship between the education status of respondents and agroforestry practices. This could especially true for Gishigara, Bishandida and Gallessa villages where majority of the respondents had first and secondary cycle educations (Table 1).

Table 1: Age, education status and HH size of the respondents, Dibate district, Benishangul Gumuz regional state, Ethiopia

Age (%)		Education (%)		Household size (%)	
<40	18.44	Cannot read and write	27.74	1-5	44.32
		Can read and write	18.32		
40-50	17.37	First cycle (1-4 grades)	27.01	6-10	44.21
50-60	48.73	Second cycle (5-8 grades)	25.55	11-15	8.47
>60	15.46	High school (9-12 grades)	1.39	Others	3.0

The large household sizes may have serious implications on the labor requirement and farm families land acquisition. As the younger members of the household grow older, the demand for farmland may increase and may lead to agitation to encroach on the forest reserve and marginal lands for farming activities. During the group discussion, it is suggested that arable land was scarce and their land had become poor to give yield. The situation is leading to increased interest of the local community in maximizing the productivity of the land they had. This may be one reason that led the local communities to practice agroforestry. This is supported by available evidences from tropics, enhancing productivity, stability and sustainability (1; 21).

Most of the farm families consist of two adults and their children (Figure 2). Elder child who could help his parents are in school during most of the year in all the villages except in Jajabagissa-Mandan. The larger family size had important contribution for the availability of family labor. To diversify the farming activities labor are detrimental factor. In addition to facilitating farm activities larger family size also reduced the need for casual labor for the family, and hence reduced monthly expenditure for laborers. Within the production year, harvesting season is the critical time for the farmers of the area. During this time the large family sizes wins the season easily, because they use family labour for transportation of their products to the market and storage. In another way in families with large sizes, the adults are engaged in selling of different tree products such as, firewood and construction materials by extracting from the natural forest that has its own contribution to the household incomes. This is the negative implication of the large family size on the forest/natural resources.

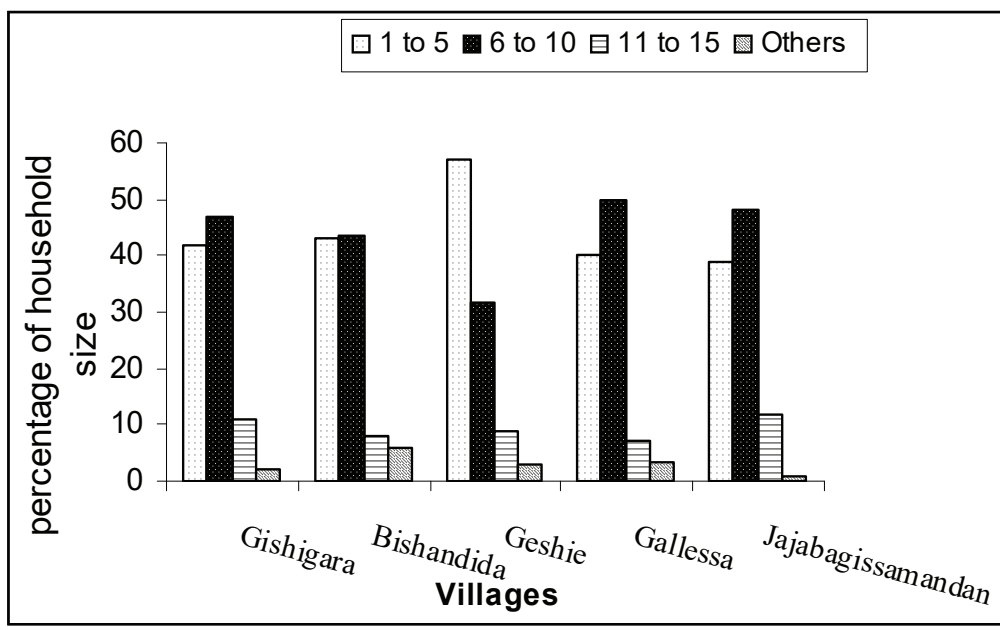


Figure 2: Household (HH) sizes of the respondents (Gallessa and Chancho kebele), Dibate district, Benishangul Gumuz regional state, Ethiopia

Evolution of vegetation cover changes over time

Key informants and HH respondents have identified and described the difference between the past and the present status of vegetation at various niches. It was mentioned that prior to the last two and three decades, the forest cover of the area was highly dense. But today because of rapid of population growth, the vegetation cover of the area has been highly depleted and almost most of the wild animals are disappearing. Increase in values and purposes of the trees raised as a case for the aggravation of the problem. So to reverse this situation it is important to understand for what purpose the trees are used. If what motivates the rural people to cut trees is do not known, it is impossible to convince them to plant trees instead (22).

Respondents indicated that informal migration to the area was listed as a reason for the rapid population growth. Migration has disturbed the traditional land holding and resource utilization system of the native people of the area. Increase in population number has been resulted in competition for arable agricultural land and construction materials, encroachment of forest areas, consequently exploitation and destruction of vegetation cover has been resulted. In addition to population growth lack of strong local land use policies and legislation that can insure effective utilization of natural vegetation and farmland trees, aggravates vegetation destruction in the area. Local norms and values are preferably used in land use policies; these have been easily broken by the new comers or migrants.

The local community put two sequences of time trends in the vegetation status of the area. That is prior and after the coming of the current government to power. Especially in the last three decades, there had been high destruction of vegetation with unprecedented increase of migration to the area. Information from the local community is indicating that, migration to the area has been a serious problem in the last three decades. After this time, the inhabitants of the area started to compete for virgin lands expanding their land holdings to the land of Gumuz ethnic group, which is an area with high forest covers and arable lands. Often this is raised as a major reason for the local conflict that was held between the Gumuz, Shinasha and the Oromo ethnic groups in 1994, which was resulted in high bloodshed.

Currently the local communities are retaining valuable tree species like Acacia abyssinica, Erithyrina abyssinica, Erithyrina brucei, Vernonia amygladina in their agricultural lands.

Domestication of some valuable tree species like Cordia africana, Breonadia salicina, Ficus vastae has also been started by the local people as lack of accessibility to wild forest resource is getting increased. Shrinkage of arable land and forest products is directing the current land use system in the area to be intensive to increase productivity of the land. Incorporating and selectively retaining valuable tree species in the agricultural lands are among the systems that the local farmers are using, but assistance of extension that can encourage the practices is negligible.

3.3. On farm Trend of tree and shrub growing practices

At farm level an increasing trend of tree-growing at different agroforestry practices is shown in (Table 2). As the farmers mentioned, before 20 years there was decrease in tree availability in most of their farming practices. Currently, relative to the previous there is high cover of trees in parklands followed by grazing lands with the less coverage in the woodlot and riverside/riparian zone of agroforestry practices (Table 2). Zeleke (8) reported that the highest tree species decrease was in niches designated as parklands in his study area, which is contradictory with the current study. The low number of tree species found in the woodlots of the current study area disagreed with the finding of Alemayehu (23) who reported the preference of diverse tree/shrub species in woodlot. Declining of trees around the riversides (Table 2) may be a reason for the problem of water scarcity reported by the local farmers.

Vegetation degradation has forced the farmers to selectively retain and plant different valuable tree/shrub species in their land use systems; this can be considered as attitude change from looking trees/shrubs as obstacle in their farming activities.

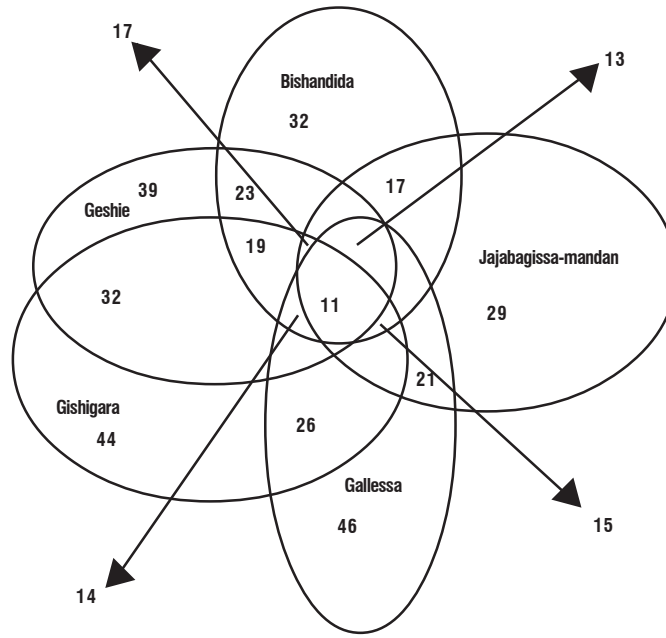
Table 2: Farmers' response on tree/shrub species increase at different niches during the last 20 years, Dibate district, Benishangul Gumuz regional state, Ethiopia

Tree/shrub species	**Percentage of respondents (n=105)**								
	HG	ST	FB	RSD	GYA	WL	LF	RDS	GL
Cordia africana	94	44	31	-	37	-	5	22	34
Croton macrostachus	17	100	82	77	84	-	69	29	96
Ficus spps.	41	71	62	-	42	-	21	-	64
Erithyrina abyssinica	-	-	73	-	-	-	92	80	55
Eucalyptus spp.	-	-	64	-	-	52	-	39	-
Mangifera indica	100	-	73	73	-	-	33	61	-
Stereospermum kunthianum	-	59	9	-	41	-	-	-	56
Combretum molle	-	88	-	-	52	-	-	-	63
Ziziphus mauritiana	-	74	-	-	-	-	-	-	39
Strychnos spinosa	-	91	67	-	47	-	-	-	100

HG=homegarden, ST=scattered trees, FB=farm boundary, RSD=riverside, GYA=gully areas, WL=woodlot, LF=live fence, RDS=roadside, GL=grazing land

Within the surveyed villages, difference in tree species was observed, and also there were common tree species grown by all villages. Farmers tried to explain adoption of important tree species, there is the tradition of experience sharing from each other. For instance, mango tree (Mangifera indica) was introduced to the area by a farmer before three decades ago; nowadays mango is a common tree in the homestead of individual farmers. Within homegardens, scattered trees in crop lands and farm boundaries of the study villages, 46 tree/shrub species in Gallessa and 29 species in Jajabagissa-Mandan were recorded (Figure 3). The figure shows number of tree/shrub species for each village and common species for the villages.

Figure 3: Number of Species Recorded in Home Gardens, Scattered Trees in Crop Lands and Farm Boundaries at the Five Surveyed Villages.



Note: on the Figure 3 above, the number with the village name is the total number of species in each village and the numbers within the circles are the common species for the villages.

There were many tree species commonly used by the all villages but there were some tree/shrub species impossible to get in certain villages (Figure 3). This may be from lack of knowledge how to use and manage these tree species within their farm lands. Within the locality there was variation in uses of the tree species. For example certain individuals are using Dichrostachys cinerea for farm implements, but others do not.

The local communities have accumulated traditional knowledge and experience on the uses of different tree and shrubs species with their management unless the species are new. For example they have no intensive knowledge on management of Eucalyptus species,

because it was introduced to the area in recent times. The farmers give high value based on the purpose or use of each tree species. A number of tree/shrub species used for similar purpose and a tree species have multi-purpose nature. For trees/shrubs that have similar purpose, there are criteria by which the farmers select a given tree/shrub species, such as nature of growing (fast or slow), market value, management system (difficult or easy), establishment system (difficult or easy), accessibility, etc. Breonadia salicina is a tree species highly preferred by the local communities for fuel wood, construction and bee hive hanging by 96.8%, 98.1% and 89.5% respectively and Cordia africana, Croton macrostachyus are the most multipurpose tree species respectively. Vernonia amygladina is the most preferred (by 76.4%) for soil fertility from the listed tree/shrub species.

Table 3: Number of HH Respondents Mentioned uses of Some Locally Available Tree/Shrub Species in Percent, Dibate District, Benishangul Gumuz Regional State, Ethiopa (n=105)

Tree/shrub species	Family name	Percent of respondents							
		FW	CW	FI	SD	BK	SF	FD	TP
Breonadia salicina	Rubiaceae	96.8	98.1	63.2	-	89.5	-	-	-
Eucalyptus species	Myrtaceae	28.3	50.4	-	-	-	-	-	-
Dichrostachys cinerea	Fabaceae	-	-	78.4	-	-	43.2	-	-
Croton macrostachyus	Euphorbiaceae	25.6	46.7	-	39.2	62.6	34.1	22.9	
Cordia africana	Boraginaceae	31.3	11.7	35.5	81.6	32.4	49.8	54.3	100
Vernonia amygladina	Asteraceae	92.5	-	-	44.8	-	76.4	82.3	-

FW=fuel wood, CW=construction wood, FI=farm implements, SD=shade, BK=bee keeping, SF=soil fertility, FD=fodder, TP=timber production

Types of agroforestry practices on the area

The types of agroforestry practices identified in Dibate include homegarden, shifting cultivation, tree row intercropping, windbreak and live fences.

Table 4: Agroforestry Practices Identified on Farms of the HH, Dibate District, Benishangul Gumuz Regional State, Ethiopia

Villages	Respondents percent (n=105)				
	Home gardens	Shifting cultivation	Tree row AF practice	Windbreak	Live fence
Bishandida	98	100	39	63	54
Geshie	100	97	27	72	66
Gishigara	100	90	48	80	73
Gallessa	91	82	54	75	79
Jejabagissa-mandan	96	100	36	51	59

Homegardens

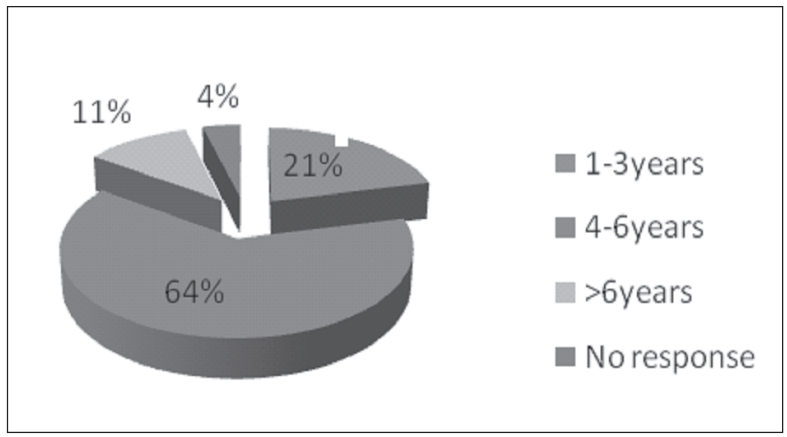
Over 91% of the respondents had homegarden type of agroforestry practice (Table 4). The limitation of forest products especially construction and fuel wood needs from the wild, and the need of additional food supply for income and consumption forced the communities to plant different exotic and indigenous tree species around their homes. Selectively leaving and planting of trees like Cordia africana and Ficus vastae near their home was a common practice in most of the local communities. Under the shade of these big trees fruit trees like Banana, Citrus species and Coffee were planted both for consumption and cash.

Shifting cultivation is the traditional cropping sequence, and the main and the old system of farming in the study area. In this farming system the productivity is determined by the potential of the soil, which is mostly maintained by the long fallow period. The fallowing depends upon the yield of the crop. When yields on a particular field drop below a certain level, the farmers allow fallow out of desperation.

Today most of the farmers in the study area cultivate the same piece of land for 4-6 years before shifting to another area (Figure 4); even this is not with good yield. The farmers indicated that about 20 years ago, there were the possibilities to cultivate a given land for

long years. In addition, they claimed that the yield obtained during the first year of cultivation after the fallow was different from the yield obtained in the first year of cultivation in recent fallow.

Figure 4: Number of HH (in %) Mentioning the Length of Cultivation Period for a given Land, Dibate District, Benishangul Gumuz Regional State, Ethiopa



Tree row agroforestry practices (Agri-horti method)

There was a practice of agroforestry in block plantation in the study area. The agroforestry practice involves planting of fruit trees mostly Mangifera indica in a wider rows in a single line with the spacing of (5x5 m) , and then crops such as sorghum, millet and maize grown between the rows. Until the branch of the fruit trees are fully expanded and close, and become shade for the growth of these agricultural crops the farmers cultivate within the open site minimum for 4 or 5 growing seasons.

Windbreaks and live fences

The communities of Chancho and Gallessa plant trees and shrubs in the border of their farm lands in order to protect their crops from strong winds, entrance of animals and human beings. When there was high vegetation cover on the area the problem of wind was not a serious problem, today there are a concern of suffering from strong winds. In summer season there is damage of crops and homes damage in the winter season. Planting trees around farmlands and homestead are becoming common practices (Table 5). The

respondents claimed that planting trees around the farmland is good for productivity of the system. The farmers also stated that windbreaks are important for their animals.

The other type of tree planting is for live fences. Currently the communities are changing dead wood fencing system to live fencing system, because of shortage of woody vegetation and its short durability. The two commonly practiced live fencing systems of the area are: live fence posts and live fence hedges, which are practiced using different tree/shrub species (Table 5).

Table 5: Tree and Shrub Species Identified by Local Communities as Preferred Species for Windbreak and Live Fences, Dibate District, Benishangul Gumuz Regional State, Ethiopa

Tree/shrub species	Windbreak	Live fences
Caesalpinia decapetala		✓
Erithyrina abyssinica	✓	✓
Vernonia amygdalina	✓	✓
Eucalyptus spp.	✓	
Agave sisalana		✓
Mangifera indica	✓	
Justicias schimperiana	✓	✓

Local knowledge in managing agroforestry practices

Trees and its management

Agroforestry is a system in which different tree/shrub species are used simultaneously or sequentially with the other components, such as animal and/or crops. Management of agroforestry practices is seen from the point of the management of the components, through decreasing the negative attribute of each component while increasing the positive attributes over each other. This study has emphasized on the knowledge of the local farmers in managing the interaction of the components within the practices.

Woody tree species, shrubs, herbs (agricultural crops or pasture plants), herbaceous vegetations and animals exist within the different agroforestry practices of the area. Fruit crops were the common components in most of the agroforestry practices. Some of the fruit species were mango, lemon, orange, banana, papaya, etc. Mango was dominantly grown in many of the practices followed by banana (Table 6). During the household survey fruit tree/shrub species were registered.

Table 6: Number of HH (in %) and Fruit Trees/Shrubs Commonly Cultivated, Dibate District, Benishangul Gumuz Regional State, Ethiopia

	Respondents with fruit trees (%)				
Fruit trees/ shrubs	Gishigara	Bishandida	Gallessa	Geshie	Jajabagissa-manda
Mango	87.3	74.5	78.1	63.4	100
Banana	59.6	42.4	25.8	51.7	34.3
Lemon	62.2	35.6	13.7	40.3	41.5
Papaya	25.2	26.1	68.7	19.6	37.7

While the local farmers are running to increase product and productivity, they have accumulated different management systems over time to control interaction of each component in the agroforestry practices. Therefore, there is considerable local knowledge on the effects of the different components of agroforestry practices over each other, which may be increase or decrease on the yield obtained.

Pruning and pollarding activities are the most frequently observed management activities done by the farmers to control negative effects of trees on their agricultural crops. Mostly tree species in the homegarden agroforestry practices were managed by pollarding. In the homegarden there were a number of tree species, so farmers were forced to pollard especially Cordia africana, Croton macrostachyus, Ficus vastae, Vernonia amygdalina during the summer season to reduce protection of sun light penetration for the understory components such as coffee and citrus species.

The local communities have recognized that the present day problems of low yields from agricultural production are directly the results of decline in soil fertility. Crop yield obtained

from the land is taken as the measurement for the soil fertility of the land. When the yield is decreased, locally the soil is said to be 'due'era' equivalent to mean the land is dead and cannot give yield. Local farmers identify the fertility status of the soil by odder, colour and type of vegetation grown on the soil.

Furthermore, farmers are developing methods to cure, improve and maintain the soil fertility status. They are developing knowledge from what they observe in their daily activities and events through their life, and they have remarkable knowledge which tree species more positively interact with a given agricultural crops. Justicias schimperiana was planted in line on the degraded lands. Then after the land has been rehabilitated back to its potential to support the growth of another tree/shrub species, tree species like Croton macrostachyus are planted, and then crops like sorghum, maize and millets are started to be cultivated between the lines on the next seasons.

Tree/shrub species preferred by the local farmers that have positive effects to their agricultural lands are given in Figure 5. Accordingly, Acacia abyssinica, Erithyrina abyssinica and Erithyrina brucei are the most preferred tree species by the respondents for the improvement of their agricultural lands. The preferences to use in the agricultural lands are based on the tree or shrub properties, such as rate of litter decay, absence of suppression to the agricultural crops, capacity to grow on poor soils and absence of severe competitive effects with the agricultural crops. This is in line with the research conducted in Nigeria, which suggests for their best trees; farmers had a wide range of preferences. Often they gave more than one character (24). These ideas are also strengthened by result of experimental researches conducted to see effect of trees on soil fertility (15) found that tree species Cordia africana and Croton macrostachyus have contributed to the high nitrogen and soil organic matter content under their canopies compared to area without trees. Nitrogen content of the soil under both trees was 26% higher than the corresponding soil away from the trees canopies. The leave part of the trees was preferred by the farmers in the integration of different tree species in agricultural lands (Table 7).

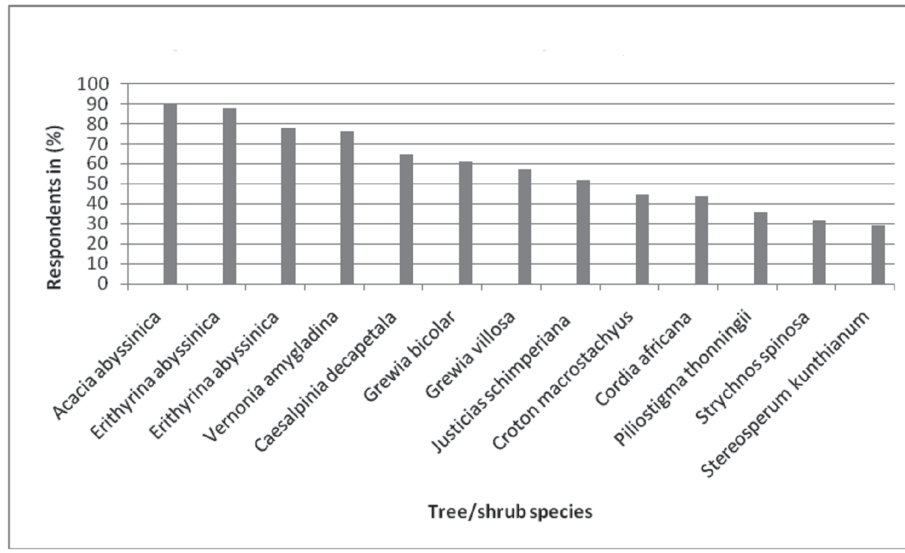
Tree species like Acacia abyssinica, Erithyrina abyssinica, Erithyrina brucei, Vernonia amygladina, etc are more preferred in the study area than Cordia africana and Croton macrostachyus for agricultural lands (Figure 5). Preference of the farmers is from the point of interaction of the trees to agricultural crops. Detailed biophysical study of these

tree species are required, why these trees are preferred by the users than those tree species preferred in the other areas.

Table 7: Tree/shrub Species Parts Identified by the Respondents as Suitable Species for Soil Fertility in Agricultural Lands (n=105)

tree/shrub species	Percent of respondents		
	Roots	Leaves	Stems
Acacia abyssinica	31.3	73.6	13.2
Erithyrina abyssinica	24.2	66.8	18.1
Erithyrina brucei	26.1	69.4	9.3
Vernonia amygladina	45.6	65.4	6.7
Caesalpinia decapetala	27.6	61.9	3.4
Grewia bicolar	19.4	59.7	11.2
Grewia villosa	16.7	63.5	10
Justicia schimperiana	39.5	43.8	-
Croton macrostachyus	12.4	67.3	3
Cordial africana	7.1	43.5	-
Piliostigma thonningii	13	31.8	9.2
Strychnos spiosa	2.4	40.3	
Stereosperum kunthianum	17.5	54.6	-

Figure 5: Trees/shrubs Preferred for Inclusion in Agricultural, Dibate District, Benishangul Gumuz Regional State, Ethiopia



Farmers have their own strategy to prefer or retain different tree/shrub species to their land uses (Table 8). An important implication of these finding is that without external assistance, farmers are capable of integrating substantial numbers of more compatible species into their land use systems and landscapes. Because the chance to get tree products from the wild is getting narrow, tree choice of farmers for construction purpose was high and for soil fertility purpose because of soil fertility decline (Table 8).

In the study area, there was no special nursery site to grow seedlings except only small nurseries near some individual homesteads. Many of the farmers collect wildings from their homegarden or from the natural forest, and give them protection. Then the wildings are planted to the desired open niches. This confirms the farmers have their own knowledge how to produce seedlings and grow trees. So knowledge limitation to grow trees may not be as a big constraint for the local farmers to practice agroforestry, which is in line with the findings obtained from the northern parts of Ethiopia by (25; 8).

Pollarding, lopping side branches, felling and coppicing are the major traditional management practices done by the local farmers to promote normal growth of the trees and to control its interaction with crops. The total lifetime contribution of a tree which is used in this way can be considerably greater than the volume it will produce if it is simply allowed to grow and is then cut down (26).

Table 8: Strategy of Farmers to Choose Trees and Shrubs in their Land uses, Dibate District, Benishamgul Gumuz Regional State, Ethiopia

Criteria	% of respondents
Palatability	69.7
Soil fertility	93.9
Construction wood	96.4
Shade	80.8
Unpalatable	41.5
Decomposability	89.4

Interaction of animals with trees in agroforestry practices

Communities of the study area rear animals like cattle, goat, sheep and poultry. But cattle are reared in high number except in Jajabagissa-Mandan village. The farmers claimed that currently the number of animals especially cattle is decreasing per household because of the shortage of grazing land and grazing materials. As most of the respondents indicated, shortage of feeding materials, especially during the dry season was the major challenge for animal production. The local farmers met the requirement of their domestic animals feed by depositing crop residues, harvesting grasses during the summer season when the grasses are available, taking the animals to another area where there is no heavy grazing; graze the cattle at night to increase length of grazing time, remnant of weeds in agricultural lands after harvest and tree fodder during this harsh condition.

In the dry season most of the grasses are dried out except near the rivers and few wet areas. At this time trees and shrubs become the important sources of feed. Mostly leaves, new shoots and pods/fruits of the plant parts are fed by the animals in this area. This is in

line with the result obtained by (27) in the southern and (8) in the northern parts of Ethiopia. In both the study sites, new shoots, pods and fruit parts of the trees/shrubs were used by animals. Mamo (27) has indicated that barks are used as feeding parts of trees in the Southern part, which is not observed in the current study site and by Abebaw in the northern part of Ethiopia.

The local farmers have long tradition in observing which tree species are preferred by their animals. They indicated that because of the shortage of feeds obtained from grasslands the numbers of tree and shrub species palatable by animals are increasing over time. There are important nutrients in the tree fodder which are not found in the other feed resources such as grasses (28). When the animals feed different tree and shrub species the farmers are continuously following its effect on the health of the animals. They have the knowledge which tree species may create discomfort to the animals when they use it.

Dichrostachys cinerea (pods and leaves), Terminalia laxifolia (leaves), Combretum molle (leaves), Grewia ferruginea (leaves), Dombeya torrida (leaves and shots), Strychnos spinosa (pods), Piliostigma thonningii (pods and leaves), bamboos (new shoots and leaves), Vernonia amygdladina, Cordia africana, Ficus vastae (pods), Ficus sur (pods) are among the tree/shrubs species noticed by the farmers preferred by their animals. During the dry season farmers collect branches from the natural forest, grassland and farmlands, chopped down the leaves of the tree and shrub species and feed their animals. This is a new tradition for the area introduced recently by the people of new comers from another area. There is competition for chopping by the farmers from the natural forest and from the free grazing system. This may be one reason for the fast destruction of vegetation covers on the area.

In addition, the local communities have knowledge about tree species used for medicinal and reproductive purposes for the animals including humans. Farmers used different tree/shrub species to cure when the animals are injured or diseased and to initiate sexually impotent bulls to facilitate reproduction. But this knowledge is only in the hands of a few. So the local farmer who has the knowledge gets economic benefit by selling these tree/shrub species for medicinal purpose.

The local communities do not only understand the advantageous of the animal interaction with the tree components, but also their negative interaction, which is mostly related with

establishment of the tree components in their farming system. The farmers claimed that planting the tree components in inappropriate place leads to reduction in overall yield production. For example, Vernonia amygladina is mostly preferred as live fence in most of the communities because of its positive attribute to the many crops. However, because it is highly palatable by cattle and goats, rather attracts animals rather than protecting the crops from animals. There is also tree species pointed out by the farmers that has negative effect on the product and health of the animals. As the farmers tried to explain Piliostigma thonningii is good palatable tree species by most of the animals in the area especially in the dry season. However, the farmers noticed that the feed reduces fatness and milk amount of the animals. Not only its effect but also they have understanding why that is so. They suggested that most of this tree leaves could not digested based on their observation when the animals were sloughed. Such a type of local farmers' knowledge is in line with the local knowledge in Kajiado district of Kenya where the Massai people developed considerable knowledge about the effects of fodder tree species on livestock health (29).

The most problematic issue related with animal rearing on the study area is free grazing system. In the dry season free grazing system is accepted as a customary and it is a usual practice on both the communal and private land. Today this grazing system is becoming a serious problem for the practice of agroforestry.

Interaction of crops with trees in agroforestry practices

Like animals, crops are also components of the agroforestry practices. The overall objective of agroforestry practice in all the system is to increase overall yield production of the system through managing the interaction of the components (Schroth, 1995). The interaction between the crop and tree component may be positive or negative. Farmers have their own view when they want to incorporate the tree components into the farmlands.

This study confirmed that farmers have great contribution for the evolution of agroforestry practices while they are struggling with their environmental condition for survival. Their local knowledge in management of the tree components at different niches is the reflection of this objective. Tree cultivation and management is a major feature of the way of life (26). In the study area farmers have the knowledge to decide which tree species fits with a given crop species or which can improve the productivity of the land (Figure 5). This

implies that the farmers have the knowledge about the role of trees in the agricultural production system, or the role of trees/shrubs to increase yields. The farmers' idea is strengthened by different experimental studies and observations conducted in many areas. In Hararghe highlands of Eastern Ethiopia, Poschen (31), Jiregna (15) found that crops under the canopy of Acacia albida were increased by 56% when compared with the crops away from the tree. Boffa (10) also reported crop yield was better around tree stumps than elsewhere in his field observation. In the Sahelian region of Senegal, it is reported that farmers have improved their yield when crops were planted with Acacia senegal, Acacia albida and Borasus aethiopum, when grown directly underneath or near trees (33).

Tree growing in the agroforestry practices

Rural people's access to trees has, especially in Africa, become more difficult with the global trends of deforestation and degradation of forests and woodlands (34). During olden times the respondents confirmed that edible fruits were excess in the wild for consumption especially for children, however, these are getting limited today. So there were no practices to plant trees except for fences and few fruit trees for consumption. However, in recent times when the communities lacked what they need from the natural forests, started to transport forest products (construction woods) from remote areas, and domestication of wild trees. The domestication of many species for food and other products has been carried out for thousands of years in almost every part of the world, often arising from extractive uses by indigenous people (35). Agricultural products were as the major sources for both household consumption and income generation. Decline in agricultural productivity was also enforcing the farmers to plant fruit trees to diversify their incomes and products.

. In the surveyed area, trees are started to be planted in the niches of homegarden, as scattered trees in agricultural lands, as farm boundaries and roadsides. Decrease in accessibility of forests and woodlands and expansion of agriculture increase tree planting traditions (36). This is appreciative condition for the future practice and development of agroforestry. It was uncommon to observe tree planting and naturally growing seedlings in most of the grazing lands. This may be from the problem of free grazing that resulted in hampering newly growing seedlings by the legs of the animals and browsing.

Farmers' attitude towards agroforestry practices

There were different opinions about the practices of agroforestry within the communities. Although agroforestry was a new word to most of the farmers the practices were well represented in different land use systems. Generally, appreciable number of the respondents, (73.8%) indicated the practices of agroforestry as ways to use the land intensively and productively. The majority (87%) of the farmers interviewed have an interest to practice if appropriate agroforestry practices that maximize land productivity and protect future land degradation could be introduced.

Farmers have traditional knowledge on the usage of trees in their daily lives as well as some environmental uses of trees such as protection of water resources and habitat for wild animals (Table 3). As the farmers indicated, previously when there was high vegetation cover on the area there were many species of birds that pray for the coming of rain using the vegetation as home. However, today because of the loss of different tree species, which are used as habitat and food, many of bird species have been disappeared. Locally it is believed that the disappearance of these bird species creates shortage of rainfall, which is an indication of the fact that the local communities have the knowledge that different tree and shrub species are sources of food and homes to wild animals.

The farmers know the easiness and quickness of inorganic fertilizer to increase soil fertility; however, there are affordability problems for majority of them. Among the respondents only 19% of them use inorganic fertilizer to some extent. Also the societies do not give equal value for agricultural crops produced by inorganic and organic fertilizers. Crops produced without inorganic fertilizers are preferred. They have understanding that agroforestry practices have the potential to diversify their incomes, increase soil fertility, provide favorable climate for their crops and animals (based on KIs interview and group discussion).

Constraints and opportunities for agroforestry development

The exact nature and significance of the different constraints and opportunities, as well as the relation between them vary depending on the specific geographical and social context (34). Understanding the exact nature of constraints and opportunities as well as rural people's needs and priorities is a precondition for developing locally adapted small-scale techniques and strategies that could be applied directly and meaningfully (37).

Factors hindering the practice of agroforestry

There were several factors identified and understood by the local communities that hinder the practices of agroforestry. Free grazing system (91.4%) and shortage of water (96.8%) were the major constraints for the practice of agroforestry addressed by the local farmers (Table 9). Free grazing is customary in the area in the dry season. During this period seedlings planted during the rainy season are destroyed by animals. Most of the existing water in the area is seasonal and the season of rain is decreasing from year to year, which is increasing the dry season that creates difficulty for the growth of seedlings. But as the study conducted in Wondo Genet most of the households (60%) reported that they did not have problems in growing trees (38). Teklay (25) showed that shortages of water and land are the major constraint in the northern part of Ethiopia, which is line with this study.

Table 9: Identified Constraints for the Practices of Agroforestry, Dibate District, Benishangul Gunuz Regional State, Ethiopia

Constraints	Percent of the Respondents
Water shortage	96.8
Free grazing	91.4
Drought	79.7
Thieves	42.1
Labor shortage	63.1
Seedling shortage	70.9
Transportation	85.2
Price	68.5
Disease	26.3

Opportunities for agroforestry development

There was an effort to organize the farmers in order to establish common nursery sites are the promoting activity just to reduce the shortages of seedling in recent years in the area. This could create high opportunities for the future development of agroforestry.

Remnant trees on farms: according to the group discussion held in each village, intentional retention of trees on the farm land is a recent practice for the area. It is hope for development of agroforestry practices, since the local farmers are becoming familiar with the importance and benefit of trees. Sinclair and Joshi 2001 (12) confirmed that farmers recognized soil and crop enhancing role of trees as most farmers preserve some trees to maintain the soil structure, enhance soil fertility and soil nutrient cycling and the exhibition of favorable interaction with crops. Therefore, for the development of agroforestry, it is simply educating and helping the farmers to utilize the full potential of the system as there are no traditions that forbid tree planting in the area.

Understanding of decline in soil fertility: farmers have complained that there is food self insufficiency, because unproductive of land. The important advantage that the farmers can get from the practice of agroforestry is increase in productivity through the maintenance of soil fertility. The knowledge that the farmers have about the soil condition of their farm land is another opportunities for the practice and development of agroforestry. The local farmers have understanding about decline in soil fertility resulting in reduction of food self-sufficiency. This is indicating that, if appropriate technologies are delivered the local communities can easily accept it, because they are in search of options to solve the problem of land productivity.

Fruit tree growing: The local farmers grow fruit trees for subsistence and income, within the vicinity of their communities and in the field. Mango (Mangifera indica), Banana (musa paradisiaca), Citrus aurantifolia and Citrus medica are the commonly cultivated fruits on the area even though their price is low in the market. This is a favorable condition if future attempts are made to combine food crops with timber species. Again because the practice is familiar within the communities, if conditions that can increase the demand of the products (e.g. value addition) are created the practice can be better developed.

Farm input costs: Most of the farmers are facing challenge to afford the high costs of farm inputs, such as fertilizer, pesticides, etc. High costs of farm input are an opportunity for the future development and practice of agroforestry. As it was possible to understand from the informal interview and group discussion most of the rural poor who use fertilizer and pesticides are under credit of these materials loaned from government. So if low-input system like agroforestry system is offered as options it can be a relief for the farmers. As

study conducted in Ghana indicated that the cost of agricultural infrastructure, pesticides, and fertilizers are assessed to be higher and beyond the reach of most farmers (Tenkorang 2003).

Increased understanding of the importance of trees: Locally, trees are used for different purposes, such as for firewood, shade, windbreaks, live fences, bordering, fodder, etc. This indicates that the woody perennials are highly demanded. In the study area dead trees are the main sources of domestic fuel for nearly all of the community. However, increase of pressure on the trees has caused shortage of some useful tree species for fuel wood. In all villages farmers have complained on the shortage of fuel wood since the responsible family members' for fetching fire wood, women and children walk long distances to acquire some.

Knowledge of the farmers about the importance of trees is another opportunity for the future development of agroforestry practices. The local communities have knowledge about the importance of different tree species. High demand led to shortage of some species (example Breonadia salicina, which is highly preferred for construction and fuel wood in the area). The local communities have complained about the shortage of trees for fuel wood and construction. This evidences that the local communities can easily accept if they get options for the problem. In the study area the local communities have knowledge about the importance of trees to maintain water sources like river and streams. This gives more hope for the adoption of even more trees for better water source management.

Conclusion and Recommendations

Result of this study confirms that there are traditionally practiced agroforestry systems, related management experience and knowledge in the current area. The retention of tree species, which are critically endangered in Ethiopia like Cordia africana, Breonadia salicina in the agroforestry practices have its own contribution for the conservation of the species. But, there are constraints needed to be addressed to encourage the development of the practices. Financial and time resources were the major limiting factors for this study; consequently, it is impossible to say the data collection was finalized without difficulties. Based on results of this study the following points are recommendable:

Learning from, building on, and working through the local knowledge is less. Hence, integration of farmers' knowledge in local development programs needs to be encouraged.

In the current study, tree/shrub inventory was not conducted. Physical enumeration of the different tree/shrub species and its diversity per each niche is necessary.

The current study is needed to be repeated based on wealth category, as it can affect the practices of agroforestry.

This study is a descriptive one, further confirmatory studies are suggested to quantify the relationships between different variables described in this study.

Acknowledgment

My grateful thanks goes to Ethiopian Ministry of Education for funding, elders, youths and development agents, and agriculture and natural resource officials of Dibate district for their guidance and sharing their precious time and knowledge.

References

Nair, P.K.R. (1993). An Introduction to agroforestry. Kluwer academic publishers, Dordrecht, The Netherlands

World Agroforestry Centre (2003). http://www.worldagroforestrycentre.org/

Kessler, J.J. (1992). The influence of karite' (Viteilariaparadoxa) and ne're' (Parkia biglobosa) trees on sorghum production in Burkina Faso. Agroforestry Systems 17: 97-118.

Agrea, J.G, Lugangwa, E., Obua, J. and Kambugu, R.K. (2003). Role of indigenous knowledge in enhancing household food security: A case study of Mukungwe, Masaka district, central Uganda. Makerere University, Kampala, Uganda.

Garrett H.E, McGraw R.L. (2000). Alley cropping practices. In: Garrett HE, Rietveld WJ, Fisher RF (eds) North American agroforestry: an integrated science and practice. ASA, Madison, pp 149-188.

Garrity, D. (2004). Agroforestry and the achievement of the millennium development goals. Agroforestrt Systems 61:5-17.

Williams-Guille´n K, Perfecto I, Vandermeer J (2008) Bats limit insects in a tropical agroforestry system. Science 320:70

Abebaw Zeleke (2006). Farmers' indigenous knowledge in managing agroforestry practices in lay-gayint district, south gonder zone, Ethiopia. MSc thesis, Wondo Genet College of Forestry, Wondo Genet, Ethiopia.

Telli-nelson Wajja-musukwe, Wilson Julia, Sprent, I.J., Ong, K.C., Deans J.D. and Okorio J. (2007). Tree growth and management in Ugandan agroforestry systems: effects of root pruning on tree growth and crop yield. Tree Physiology 28, 233-242.

Boffa, J.M. (1999). Agroforestry parklands in Sub-Saharan Africa. FAO Conservation Guide 34, Rome, Italy 230pp.

Warburton, H. & Martin, A.M. (1999). Local people's knowledge. Best practice guideline. Socio-Economic Methodologies Programme. London, DFID.

Sinclair, F.L. and Joshi, L. (2001). Taking local knowledge about trees seriously. In A. Lawrence (ed) Forestry, forest users and research: new ways of learning. ETFRN, Wageningen, pp. 45-61

Badege Bishaw (2001). Deforestation and land degradation in the Ethiopia Highlands: A strategy for Physical Recovery. Northeast African Studies, 8 (1): 7-26.

Badege Bishaw and Abdu Abdelkadir (2003). Agroforestry and community forestry for rehabilitation of degraded watersheds in Ethiopian highlands. International symposium on contemporary development issues in Ethiopia, Jully 11-12, Addis Ababa.

Jiregna, G. (1998). Decomposition and Nutrient release from leaves of croton macrostachyus and millettia ferruginea for soil improvement in agroforestry system. Msc Thesis, Skinnskatteberg, ISSN 1402-201X.

Berhane Kidane and Agajie Tesfaye (2006). Agroforestry practices and tree planting constraints and opportunities in Sekota district of the Amhara Regional State. Journal of the drylands 1(1): 52-63.

Smith, N., J. Dubois, D. Current, E. Lutz, & C. Clement. (1998). Agroforestry Experiences in the Brazilian Amazon: Constraints and Opportunities. The Pilot Program to Conserve the Brazilian Rain Forest, Brasilia. Brazil.

Bezabih Emana (2010). Market assessment and value chain analysis in Benishangul Gumuz region state, Ethiopia final report. SIDA-Consult-Support Integrated Development, Addis Ababa, Ethiopia.

Minilik Wube, Epherem Alemu, Abera Endeshaw and Girma Nemera (2009). Matching funds allocation in the Ethiopian Water Supply and Sanitation Project (EWSSP). A case study in Benishangul-Gumuz regional state. RiPPLE, Research-inspired Policy and practice Learning in Ethiopia and the Nile Region, Working Paper No 10.

CSA (2007). Central Statistics Agency of Ethiopia: Table for Benishangul Gumuz Region.

Brils C., Paulien V. E., Bertken L., Peter P. (1996). Agroforestry. Lidy Wallace (ed.) Agromisa Foundation, Wageningen, The Netherlands pp60.

de Kat-Reynen, C. (2003). (ed) Agroforestry: agrodok 16. Agromisa Foundation, Wageningen.

Workneh Alemayehu (2002). Farmers' knowledge and attitude towards tree planting and farm forestry practices. A case of Awi zone of Amhara region, Ethiopia. Ethiopian MSc. in Forestry programme. Thesis Report No.2002:58 pp74.

Lovett, P.N. and Haq, N. (2000). Evidence for anthropic selection of the sheanut tree (Vitellaria paradoxa). Agroforestry systems 48:273-288.

Tesfay Teklay (1996). Problems and prospects of tree growing by smallholders farmers: A case-study in Felege-Hiwot locality, Eastern, Tigray, Ethiopia M.Sc.thesis Skinnskatteberg Report No 1996:7

FAO (1985). Tree growing by rural people food and agriculture of the United Nations No.64, Rome, Italy pp130.

Yosef Mamo (1997). Current role and the potential of three indigenous tree species of Ethiopia: Eherita cymosa, Vernonia amygdalina and Faidherbia albida, as feed for livestock under traditional agroforestry practices. Ethiopian MSc. in Forestry

Komwihangilo, M. D., Goromela, E.H. and Bwire, J. M. N. (1995). Indigenous knowledge in utilization of local trees and shrubs for sustainable livestock production in central Tanzania. Livestock Production Research Institute 6 (3): 10.

Kiptot, E. (2002). Utilization and conservation of fodder trees and shrubs in Kajiado district, Kenya: starting with farmers' knowledge In: Agroforestry study visit to Malawi and Zambia, 20-30 January 2002, David N. Ngugi Report, CTA working document number 8028. The Netherlands, pp38-46.

Schroth, G. (1995). Tree root characteristics as criteria for species selection and systems design in agroforestry In: Agroforestry: science, policy and practice Fergus L. Sinclair (ed.) Kluwar Academic Publishers. Agroforestry Systems 30:125-143

Poschen, P. (1986). An evaluation of the Acacia albida-based agroforestry practices in the Hararghe highlands of Eastern Ethiopia. Agroforestry Systems 4: 129-143.

Jiregna G., Rozanow, A. and Legesse N. (2005). Trees on farms and their contribution to soil fertility parameters in Badessa, eastern Ethiopia. Biology and Fertility of Soils 42: 66-71.

Rocheleau, D., Weber, F. and Field, J. A. (1988). Agroforestry in dry land Africa, ICRAF, Nairobi, Kenya pp 499.

Nathan, I., Lund, S. and Theilade, I. (2007). People, Trees and Agriculture in Africa: Constraints and Options for Improved Management of Trees in Tanzania and Burkina Faso. In: the importance of local knowledge and interdisciplinary research.

Homma, A.K.O. (1994). Plant extractivism in the Amazon: Limitations and possibilities. In M. Clusener-Godt and Isachs (eds) Extractivism in The Brazilian Amazon: Perspectives in Regional Development (pp 34-57). MAB Digest 18, Man and the Biosphere. Paris: UNESCO.

Arnold, J. Michael, E. and Dewees, P. (1998). Rethinking approaches to tree management by farmers. Overseas Development Institute, UK.

Simons, A. (1997). The importance of germplasm policies in tree domestication. Advance proceedings of the international workshop on policy aspects of tree germplasm demand and supply, organised at ICRAF, Nairobi, 6-8 October 1997.

Abebe Seifu (2000). Farmers' tree planting and management tradition at Wondo Genet, Ethiopia MSc thesis Tropical forestry Wageningen University. The Netherlands pp67.

Tenkorang H. K. A. (2003), Farmers perception on Agroforestry practices as an alternative to traditional farming in Atwima District of Ashanti Region (unpublished thesis).

Hybrid Rice Seed Production in Khammam District of Telangana State: A Critical Analysis

M. Venkataramulu[1], J. Hemantha Kumar [2] and Venu Prasad H D [3]

Abstract

The success of hybrid rice cultivation depends on the success of the hybrid rice seed production programme which enables seed producers to produce high quality seed at an economical price. Different private companies are promoting this hybrid rice seed production and farmers are switching over to adopting the hybrid rice seed production against the traditional rice cultivation. Hybrid rice seed production requires specialized techniques which must be fully understood by the production staff. With this backdrop the present study was carried out to know the cost of cultivation of hybrid rice seed production in comparison with non hybrid rice production and also look into the aspects of constraints, reasons and suggestions given by the farmers regarding hybrid rice seed production in the Khammam district of Telangana during 2014-15. A total of 120 farmers were selected using multistage sampling method and they were personally interviewed with the help of schedule. The results from the study indicate that the net income obtained from hybrid rice seed production was Rs. 29,822/- per acre and that of non-hybrid rice was Rs. 9419/- per acre. The constraints faced by the farmers in cultivation of hybrid rice seed production includes hard work involved in cultivation compared to non-hybrid rice, difficulty in setting pollination, separate operations for male and female parents etc. As much as 82 per cent of the respondents expressed high profit from hybrid rice seed production when compared to non-hybrid rice and this is the major motivational factor among farmers to take up hybrid rice seed production in future. Also, nearly 48 per cent of the respondents felt that the prices offered by the company was low and it need to be increased.

Keywords: Rice, Hybrid rice, Hybrid seed production Telangana, India.

---

[1] Scientist (Extension) Agricultural Information & Communication Centre, Acharya N.G. Ranga Agricultural University (ANGRAU), Guntur - 522034. Corresponding Author Email : diplomat_vr@rediffmail.com

[2] Programme Coordinator, Krishi Vigyan Kendra, Wyra, Khammam, Telangana.

[3] Scientist, Training Education and Extension Division, Centre for Water Resources Development and Management (CWRDM), Kozhikode, Kerala.

Received Date: 02-06-2020 Accepted Date: 28-06-2020

Introduction

Rice (Oryza sativa L.) is the most important food crop of the world and it is the main source of food for more than half of the world's population including India. As the demand for rice is rapidly increasing with the increase in population and the near stagnant yield levels of semi-dwarf varieties of the green revolution era, there is a need for alternate solutions to boost rice production. Hybrid rice is one such practically feasible and readily adoptable option to increase the rice production. Seed is the real vehicle of production and other inputs like water and fertilizers can be regarded as fuel. The production of quality seeds is a specialized task and due care should be taken during various stages of crop development. To produce hybrid rice, a good quality hybrid seed is required and a large number of private firms have been actively involved in the production of hybrid seed. Telangana is the largest producer of hybrid seeds, followed by Maharashtra and Karnataka (www.downtoearth.org.in). Out of the total hybrid seeds market in India, paddy has a market share of only nine per cent. The major part of the hybrid seeds market is of Bt cotton (41 per cent), followed by maize (15 per cent) and fruits and vegetables (13 per cent). Despite the market share of 9 per cent, the area penetration of hybrid paddy is just 6 per cent of total paddy cultivation.

Currently hybrid rice seed production is taken up in the rabi season primarily in Telangana State. In this region, the crop is harvested by April-May, which after drying, processing, testing, packaging and transportation reaches north India for hybrid rice cultivation. More than 80% of the total hybrid rice area is in Eastern Indian states like Uttar Pradesh, Jharkhand, Bihar, Chhattisgarh, with some little area in states like Madhya Pradesh, Assam, Punjab, and Haryana. Good rice hybrids have the potential to yield more than 15-20 per cent of the best inbred variety grown under similar conditions. Sivagnanam and Murugan (2020) in their study found that hybrid rice yield rate had increased to 21.48 per cent compared to high yielding rice varieties during 2010-2011.

In 2018, the total market for seeds in India was valued at Rs 4.30 lakh crore. It is projected to increase by Rs 6.45 lakh for 2021. Around 50 per cent of the global seed market is controlled by a few multinationals such as Bayer AG (Germany) and its subsidiary Monsanto Co, DuPont (USA) and Chinese-owned Syngenta AG. According to the latest market study released by Technavio, a market research organisation, the hybrid seeds market in India is expected to grow at a Compound Annual Growth Rate of almost 13 per cent until 2021. As many companies are involved in this hybrid rice seed production,

this paper explores the cost of cultivation of hybrid rice seed production, constraints faced by farmers at field level as well as the suggestions from the farmer side.

Methodology:

Khammam district of Telangana State was selected purposively for the study and from this district, 8 Mandals were selected on the simple criteria that the area under hybrid rice seed production was maximum. The mandals selected under the study includes- Dummugudem, Cherla, Sattupalli, Garla, Bayyaram, Nelakondapalli, Dammapeta and Kusumanchi. A total of 120 farmers were selected proportionately by considering the number of farmers growing hybrid rice for seed production in each Mandal. Similarly, a control group of 120 non-hybrid rice farmers were selected for studying the cost of production. Primary data related to the cost of inputs and different operations in hybrid rice seed production and non- hybrid rice along with yield were collected from the farmers during 2014-15. As most of the researchers used to design their questions by referring to the existing literature, in this study, in order to obtain the real field level situation, the questionnaire was designed with open ended questions, so that the farmers can freely express their problems and constraints in hybrid rice production. Apart from this, the study also looks into the suggestions from the farmers' point of view.

Results:

Comparison of cost of cultivation of Hybrid rice seed production and non-hybrid rice in Rabi season:

A detailed study of cost of cultivation of both hybrid and non-hybrid (conventional rice) rice is presented in the table 1.

Table 1: Comparison of Cost of Cultivation of Hybrid Rice Seed Production and Non-Hybrid Rice in Rabi Season (Rs. /Acre)

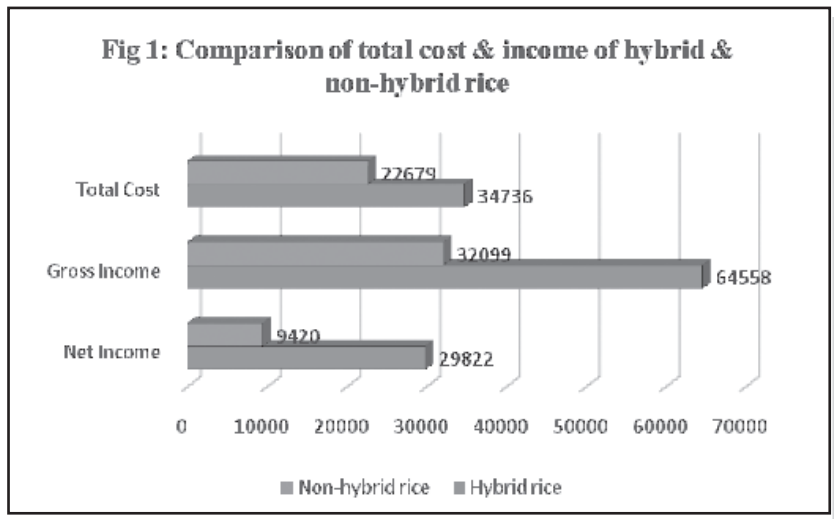
S.No.	Particulars	Hybrid Rice Seed Production Cost	Non-Hybrid Rice Cost
1	Seed	266	657
2	Seed treatment	0	21
3	Nursery	1058	1097
4	Land preparation	4059	4042

5	Transplantation	3869	2335
6	Fertilizer	5316	4398
7	Weeding	1956	469
8	Labour for weeding	0	1481
9	Irrigation	646	214
10	GA3	574	0
11	Supplementary pollination	4490	0
12	Roguing	2859	0
13	Insecticide	3688	3595
14	Harvesting Female	2096	2235
15	Harvesting Male	1979	
16	Threshing	1487	1230
17	Bags	71	274
18	Packing	268	0
19	Miscellaneous expenses	46	625
20	**Total costs**	34736	22678
21	Yield female (qt/acre)	7	26
22	Yield male (qt/acre)	7	
23	Rate female	7903	1175
24	Rate male	1052	
25	Straw yield (qt/acre)	17	17
26	Rate for straw	230	468
27	Income for Female	54795	31025
28	Income for Male	7497	
29	Income for straw	758	1073
30	Compensation	1507	0
31	Gross income	64558	32098
32	Net income	29822	9419
33	C:B ratio	1.86	1.42

Note: The amount mentioned is as per 2014 market price.

The results from the above table clearly indicate that the total cost incurred by hybrid rice per acre (Rs.34736/-) is more compared to non-hybrid rice (Rs. 22678/-). The increase in cost of production in hybrid rice is mainly due to pollination and fertilizer cost. If we look at the Gross income, hybrid rice has taken a step higher level (Rs. 64558/-) when compared to non-hybrid rice (Rs. 32098). The net income component from hybrid rice looks promising at Rs. 29822/- per acre when compared to non-hybrid rice at Rs. 9419/-.

Total cost, gross income and net income from both hybrid and non-hybrid rice (Fig.1). The Benefit: Cost ratio is observed to be highest in hybrid rice (1.86) compared to non-hybrid rice (1.42). Chanda et al. (2019) in their study found that the Boro (Hybrid) rice gave high benefit cost ratio (BCR) and it varies from 2.10-2.36 when compared to other HYV and local varieties of rice.



Constraints faced by the Hybrid Rice Seed Production Farmers:

Table 2: Constraints Faced by the Hybrid Rice Seed Production Farmers (N=120)

S.No	Constraints	Frequency	Percentage
1	Hard work compared to rabi paddy	84	70.00
1a	Supplementary pollination	38	31.67
1b	Separate operations for Male & Female	16	13.33

1c	Transplantation	12	10.00
1d	Roguing	10	8.33
1e	Harvesting of Male	6	5.00
1f	Nursery raising	2	1.67
2	Non availability of timely labour	46	38.33
3	High cost of labour	34	28.33
4	High risk	32	26.67
5	High cost of cultivation	20	16.67
6	Electricity shortage	20	16.67
7	Synchronization problem	14	11.67
8	High water requirement	6	5.00
9	Payment is very late	6	5.00
10	High fertilizer requirement	6	5.00
11	High incidence of pests and diseases	6	5.00
12	Timely operations	6	5.00
13	Improper guidance	4	3.33
14	High fertilizer cost	4	3.33
15	Levelling of land	2	1.67
16	Powder spraying causing itching	2	1.67
17	No contacts with company	2	1.67
18	Not giving compensation	2	1.67

If the technology is new to any area then there are problems that arise out of it, in this study also the constraints faced by the farmers with respect to hybrid rice production were surveyed (Table 2). As much as 70 per cent of the respondents revealed that there is a hard work involved in hybrid rice seed production compared to non-hybrid rice. Mainly due to the crop care to be taken especially for the growth of male and female parents for flowering synchronization for effective pollination and harvesting of male and female parents separately. Research findings from Shah and Thomas (2015) found that that a vast majority of non-adopters (97.5%), de-adopters (94.2%) and continuing

adopters (89.2%) perceived moderate to serious risks in cultivating hybrid rice seed production. Around 31.67 per cent of the farmers were of the opinion that supplementary pollination is one of the constraints faced by the farmers. This may be due to the fact that in hybrid rice seed production yields depends upon the pollination, hence to increase the pollination, farmers have to carry out mechanical pollination. In a study by Manjunath and Prasad (2012) reported that nearly 90% of seed growers experienced the problem of non-availability of trained labor in crossing operations. Non availability of timely labour contributes 38.33 %. This is mainly due to the fact that the hybrid rice production is cultivated to the maximum extent in certain villages at the same time and the demand for labour to perform pollination also increases.

In spite of the difficulties faced by the farmers in cultivation of hybrid rice seed production like, hard work involved in cultivation compared to non-hybrid rice, difficulty in pollination, separate operations for male and female plants etc. the farmers continue to express their willingness to go for hybrid rice seed production. It is revealed that 98 per cent of the respondents expressed high profit from hybrid rice seed production when compared to non-hybrid rice and this is the major motivational factor among farmers to take up hybrid rice seed production in future (Table 3). Nirmala and Suhasini (2013) in their study revealed that the main reason to continue cultivation of hybrid rice by the farmers was hope for better yield from cultivation of hybrid rice. Janaiah and Xie (2010) in their study found that Hybrid rice cultivation generated an additional net profit of about 13% in Chhattisgarh and about 33% in Uttar Pradesh. Furthermore, they also revealed that 100% of the farmers in their study are willing to take up seed production in the future because of its high profitability and assured profits.

Around 21.67 per cent of the respondents felt that compensation provided by the company in case of failure as one of the factors drives them to take up hybrid rice. Nearly 12 per cent of the respondents felt that the hybrid rice production can generate employment and that made the farmers to go for hybrid rice seed production in future. These are the three major factors that drive the farmers to opt for continuing hybrid rice seed production in future.

Reasons for Continuing Hybrid Rice Seed Production:

Table 3: Reasons for Continuing Hybrid Rice Seed Production (N=120)

S.No	Reasons	Frequency	Percentage
1	High profit than rabi paddy	98	81.67
2	Providing compensation	26	21.67
3	Providing employment	14	11.67
4	Market problem for commercial paddy	6	5.00
5	Regular technical advice	4	3.33
6	Fixing rates at start of the cultivation only	4	3.33
7	Providing inputs by organizer & company	4	3.33
8	Providing credit without interest	2	1.67
9	Payment through online	2	1.67

During the field survey suggestions were asked from farmers view point to improve the services of seed companies (Table 4). The results revealed that nearly 48.33 per cent of the respondents felt that the prices offered by the company was low and it need to be increased. As much as 26.67 per cent of the respondents expressed delay in payments and suggested to make payments quickly. Around 18.33 per cent of the respondents suggested to provide inputs at low cost, 15 per cent of the respondents suggested to increase the amount of credit that the company used to pay at the initial stages of crop growth. A small fraction (13.33 %) of the respondents suggested providing seeds of high yielding hybrids, this may be due to the fact that the company provided seeds may not yield higher as anticipated by the farmer. Negi et al (2020) in their study revealed that the relative yield advantage of hybrids over open-pollinated modern varieties is not large enough to incentivize rapid adoption of hybrid rice technology. A relatively small portion (10 %) of the respondents suggested that the companies to guarantee the compensation in case of crop failure. This may be due to the fact that the hybrid rice is new to this region and the farmers may fear that the chances of crop failure may hamper the conditions of future tie up with the company. Fear of failure component among the respondents towards a new technology (in this case previous knowledge of hybrid rice seed production) also

be the factor to ask for compensation guarantee. Abebrese et al (2019) in their study in Ghana found that 80 per cent of the farmers did not have previous knowledge about hybrid rice cultivation.

Suggestions for Seed Companies to Improve their Services:

Table 4: Suggestions for Seed Companies to Improve their Services

(N=120)

S.No	Suggestions	Frequency	Percentage
1	Increase in price	58	48.33
2	Make payments quickly	32	26.67
3	Provide inputs for low cost	22	18.33
4	Increase the amount of credit	18	15.00
5	Provide seeds of high yielding hybrids	16	13.33
6	Compensation guarantee	12	10.00
7	Don't cut 10% in weight	8	6.67
8	Direct contact with farmers without local organizers	8	6.67
9	Develop transplanting machine	6	5.00
10	Weighing and grading to be done in presence of farmer	6	5.00
11	Develop small scale machine harvesters	6	5.00
12	Provide labour cost for transplantation, pollination & rouging	4	3.33
13	Conduct health campaigns	4	3.33
14	Develop mechanical supplementary pollination	4	3.33
15	Regular technical guidance by company staff	2	1.67
16	Increase compensation	2	1.67
17	Buy male seed	2	1.67
18	Create infrastructure facilities	2	1.67
19	Provide safety equipment	2	1.67

Apart from the suggestions towards company's improvement, suggestions to improve Government intervention in hybrid rice production is also collected during the field visit (Table 5). From the table it is clear that as much as 40 per cent of the respondents were of the opinion that the company should operate through Mandal Agricultural Office (MAO). This may be due to the fact that they fear the company's hybrid seed may not give yields all the time. Nearly 25 per cent of the respondents stressed the need to compensation, this may be due to difficulty in pollination of the crop and crop set. Around 18.33 per cent of the respondents suggested to increase price payed by the company and suggested the Government to fix MSP (Minimum Support Price). An equal per cent (18.33%) of the respondents also suggested to provide subsidy on inputs and make availability of inputs as and when it is needed. Nearly 13.33 per cent of the respondents suggested providing insurance in case of crop failure due to poor crop set. A fraction (10 %) of the respondents suggested the Government to create awareness among the farmers to go for hybrid rice production. This may be due to the fact that the farmer receives good profit from hybrid rice compared to non-hybrid rice. Sivagnanam and Murugan (2020) in their study in Tamil Nadu revealed that some of the districts such as Thiruvallur, Karur, Dindigul and Kanyakumari have not adopted the hybrid rice technology due to lack of awareness among the farmers, less availability hybrid seeds, technical problems, high cost of cultivation and absence of enthusiasm from government.

Suggestions to Government for Promotion of Hybrid Rice Seed Production:

Table 5: Suggestions to Government for Promotion of Hybrid Rice Seed Production (N=120)

S.No	Suggestions to Government	Frequency	Percentage
1	Companies should operate through MAO	48	40.00
2	Make compensation as mandatory	30	25.00
3	Increase price & Fix MSP	22	18.33
4	Provide inputs on subsidy	22	18.33
5	Make availability of inputs	22	18.33
6	Provide insurance	16	13.33
7	Create awareness	12	10.00

8	Provide credit	6	5.00
9	Develop technology for easy supplementary pollination	4	3.33
10	Grading to companies	4	3.33
11	Provide irrigation facilities	4	3.33
12	Provide power supply	4	3.33
13	Govt. Should purchase male seed	4	3.33
14	Give due recognition to hard work	2	1.67

Conclusion:

It is clearly evident from the findings that the net income obtained from hybrid rice production compared to non-hybrid rice production was Rs. 29, 822/- per acre and that of non-hybrid rice was Rs. 9419/- per acre. This reveals about the profitable nature of hybrid rice seed production compared to non-hybrid rice. The higher profit is the main reason that the farmers expressed willingness to take up the crop in the future. The visibility factor of the hybrid rice production helps in continuing the adoption of an innovation. The farmers expressed concern about difficulties in pollination and also growing male and female lines separately. It may be due to the fact that they were not used to do this kind of cultivation earlier as it is new to them. The climatic factors and new parental hybrids for hybrid rice seed production also expressed concern about the failure of crop; hence some of the farmers stressed the need for compensation. Even some of the farmers suggested the Government to involve in fixing compensatory mechanism for the hybrid rice seed production as a mandatory. This indicates that the farmers are ready to take up the hybrid rice seed production but the fear of crop failure may discourage some of the farmers to discontinue production in the future. Furthermore, the farmers suggested that if the companies operate through Mandal Agricultural Officers, the confidence among the farmers will improve and this leads to an increase in number of farmers to go for hybrid rice seed production. The farmers also expressed concern about the prices offered by the private companies at the time of harvest and delay in payment. From the company's point of view at least the payment to be made timely so that the farmers gain confidence in the company.

It is of utmost important for the R&D sector to develop hybrids which suits to all the agro-climatic regions. Promotional efforts from the Government side are very low, and areas where good irrigation facilities are available, Government has to promote this hybrid rice seed production among the farmers.

References

Abebrese, S. O., Martey, E., Dartey, P. K. A., Akromah, R., Gracen, V. E., Offei, S. K., and Danquah, E.Y. (2019). Farmer Preferred Traits and Potential for Adoption of Hybrid Rice in Ghana. Sustainable Agriculture Research. 8 (3): 38-48.

Chanda, S. C., Ali, M. A., Haque, M. E., Abdullah, M. R., and Sarwar, A. K. M. G. (2019). Cost of production and cost benefit analysis of different rice in Sirajganj district. Asian Journal of Crop, Soil Science and Plant Nutrition, 01(01): 07-14.

Manjunatha, G., and Venu Prasad, H. D. (2012). Mode of operation and constraints of hybrid vegetable seed production under contract farming in Karnataka. Environment & Ecology, 30(2): 364-367.

Hybrid Rice Seed Production Technology under North Indian Conditions. Retrieved from https://www.iari.res.in/index.php?option=com_content&view=article&id=201&Itemid=1094

Janaiah, A., and Xie, F. (2010). Hybrid rice adoption in India: farm-level impacts and challenges. IRRI Technical Bulletin No. 14. Los Baños (Philippines): International Rice Research Institute.

Negi, D. S., Kumar, A., Birthal, P. S. and Tripathi, G. (2020). Adoption and Impact of Hybrid Rice in India: Evidence from a Large-Scale Field Survey. IFPRI Discussion Paper 01910.

Nirmala, B., and Suhasini, K. (2013). Farmer's experience with hybrid rice technology: A case study of Khunti district of Jharkhand State of India. African Journal of Agricultural Research. 8(29):3973-3975.

Santosh K. Singh. (2020). Grain and Feed Annual. United States Department of Agricultural. Report Number: IN2020-0012.

Shah, M. M. I., Grant, W. J., and and Stocklmayer, S. (2015). Farmers' perception of risk in cultivating hybrid rice in Bangladesh. S. Afr. J. Agric. Ext., 43(2): 17-29.

Shah, T. H., and Thomas, M. (2015). Comparative Study of Production Cost and Net Returns in Rice and Lac Cultivation. Trends in Biosciences. 8(3): 788-791.

Sivagnanam, K. J., and Murugan, K. (2020). Impact of Hybrid Rice Cultivation on Farmers' Livelihood in Tamil Nadu Journal of Land and Rural Studies. 8(1): 22-36. DOI: 10.1177/2321024919883101.

Why companies are lobbying to push for hybrid paddy seeds in India. Retrieved from https://www.downtoearth.org.in/blog/agriculture/why-companies-are-lobbying-to-push-for-hybrid-paddy-seeds-in-india-66603

Significance of Agro Textiles in Crop Production

Prerna Kapila[1] and B S Dhillon[2]

Abstract

Agriculture is a major sector of Indian economy and an important employment provider. Agro textiles are the application of textile materials in the field of agriculture manufactured by involving various techniques to limit the use of pesticides and herbicides during crop production, crop protection, storage and transportation. For successful application as Agro textiles, a material should have properties to withstand solar and ultraviolet radiations and should have good protection capabilities along with being Bio degradable. Agro textiles have various usages not only limited to crop protection but also used for water management like drip and sprinkler system and for lining of ponds to prevent seepage and evaporation. Mainly knitted fabric is used for this purpose with varying GSM and composition depending on the application and properties required from the textile material. Studies suggest that there is a possibility of 10-40 per cent loss in crop production due to climate change and increase in atmospheric temperature in next 30 years. Increasing usage of agro textiles which help in providing a controlled environment for the crop to grow in most favorable conditions can help in improving the efficiency of agriculture sector. It is important that enough awareness regarding benefits of agro textiles is created to increase its usage and decrease its cost to make commercially viable and acceptable and bring the prices at par with international supply chain.

Keywords: Agro industry, Textile industry, Agro textiles, Biodegradable products.

Introduction

It is truly said that agriculture is the backbone of India. It is a major sector and one of the most important employment providers in India. Deshpande (2017) in her report on State

[1&2] Assistant Professor, Krishi Vigyan Kendra, Nag kalan-Jahangir, Amritsar (143 601), India.
Corresponding Author Email : prernaats@pau.edu

Received Date: 25-06-2020 Accepted Date: 30-07-2020

of Agriculture in India stated that the agriculture sector contributes around 17.5 per cent of our total GDP and approximately 10 per cent of our export is of agriculture related products. She also pointed out that 50 per cent of our workforce is directly or indirectly involved in Agriculture sector. Another sector which has significant contribution in the economy of our country is textile sector. Textiles, in some form or the other, have always been of use in the agriculture industry, but initially, the usage was restricted to packaging of the agricultural produce. Kapoor et al., 2017 gave an overview of agro textiles and said that a textile fabric has a long history of application in agriculture. Marasovic, 2019 said that the significance of agrotextiles can be substantial all over the world since it has proven to be very versatile and cost effective materials. The word Agro-textiles now is used to classify the woven, nonwoven and knitted fabrics applied for agricultural & horticultural uses covering livestock protection, shading, weed and insect control, and extension of the growing season. Agro textiles help to keep sufficient soil humidity and increase the soil temperature. Chowdhry et al., (2017) studied importance of agro textiles and suggested that Agro-textile is a crucial and emerging sector among all the twelve sectors of technical textiles. It covers all the textile products from horticulture application to fishing and animal husbandry application. In Bangladesh, some application of agro-textiles products has shown great extent of outcomes and it has positive impacts on growth and production of various crops including vegetables. The use of agro-textiles helps the farmers to minimize the use of harmful pesticides. About 40 percent energy can be saved by the usage of greenhouses (Paul et al., 2012).

Ajmeri (2016) stated that textiles have found their use in agriculture for thousands of years to protect the plants and animals against adverse environmental conditions. Diversity of textile products are profitably used in agriculture like fishing nets, ropes, shade nets, jute bags, mulch mats, etc. Many companies have built competitiveness and obtained tremendous profits through new product development. Global competition in textile has become more intense and the firms need to be innovative to compete (Choi, 2005).. Agro textile sector is gearing hard to improve the efficiency of crop production by using suitable agro textiles so that better crop yield can be achieved year after year. (Kapila, 2019)

However, the latest development in the field of textiles, especially the technical textiles, have made this sector indispensible for the agriculture industry and in a way, has come

forward as the backbone of agricultural industry. Subramaniam et al., (2009) suggested the fact that in era of modernization the agro-textiles will serve the purpose to boost the high productivity in agriculture sector. The technological advancements have enabled the textile materials find their irreplaceable use in areas like agriculture, horticulture, livestock and fishery. This class of textile materials used in agriculture sector is known as agrotech segment of technical textiles. The textile materials hold a great potential for improvement and enhancement in the quantity and quality of the agricultural products. (Bhatt et al., 2019) These textiles also protect the plants from the climatic change and its harmful effect on the plants (Agrawal, 2013).

Agro textiles can be termed as the application of textile materials in the field of agriculture. Textile manufacturing involves various techniques like weaving, warp and weft knitting, and some non woven techniques. The textile materials prepared by any or a combination of these techniques are effectively used today for crop protection and storage of the products. These textile materials have not only helped in limiting the use of pesticides and herbicides during crop production, but have also influenced safe storage and transportation of agriculture production thus improving the efficiency and productivity of agriculture sector and reducing damage to environment. Constant innovations are going on in textile industry so that a suitable material can be produced for crop protection purpose which is also cost competitive so that large number of farmers can achieve the benefits.

The textile industry is innovating with fabrics in order to produce a superior quality product and also give price competitiveness so that more and more farmers can be inclined towards usage of agro textiles for crop protection and storage purpose. The requirement of innovation in a global market for a qualitatively superior product which can be suitable to the climate differences in a country as vast as India and is also suitable to the local needs has forced the textile companies to work extensively in this field. The products thus created have proved to be beneficial to the crops and has been replacing traditionally used products in agriculture due to their cost effectiveness and efficiency (Sankhe et al., 2002). As per a report by "Grand view research" on the global market size of agro textiles, it was estimated that the demand for agro textiles to be used specifically in agriculture applications is expected to reach 558 kilo tons by 2025 and is growing at an estimated CAGR of 4.4% from 2017 - 2025. The global agro textiles market is expected to reach USD 12.77 billion by year 2025 (Basu, 2011). The fabrics used in crop production not only help in increasing

productivity but also improves crop quality and prevent losses due to weather extremities (Paul et al., 2012a).

Properties required in Agro Textiles:

The Agro Textiles are required to be consisting of the following properties:

1. They should be able to withstand solar radiation.
2. They should have the capacity to withstand ultraviolet radiations.
3. The textiles should be Bio degradable.
4. They should have high potential to retain water.
5. The textiles should have good protection properties.

Application of Agro Textiles

Wind Break and Hail Control Fabrics:

Agro textiles are used to prevent plants from wind and hail storm. These are specially required in areas where wind speed is considered to be high. Normally plants which are protected from wind are healthier and reach full growth rapidly. These fabrics are tough, strong and heavy duty netting usually of 110 GSM. It reduces wind speed by 50 per cent and also sunlight by 50 per cent of its strength. Hail protection fabrics help shield vines from damage to the fruits and defoliation which are associated with hail while allowing enough sunlight for the growth of plant. These are made of UV stabilized polyethylene filaments which could be both knitted and woven.

Sun Block Fabric:

Sun Block or Sun shade fabrics are made up of polypropylene mono filaments in both knitted and woven constructions and absorb 90 per cent of sunlight. These are used to develop a micro climate for plantation of ornamental plants, fruits and flowers. Woven sunshade fabric is made from 100% polypropylene monofilament strands and knitted sunshade fabrics is made from 100% UV stabilized polyethylene. U V stabilized high density polyethylene fabrics also resist mold and mildew growth and protects plants from direct sun while allowing water and air through.

Temperature Control Fabric:

Spun bound polyester fabric used for temperature control is designed to save crops from cold, insects, frost and a large number of adverse environmental factors. These fabrics are used to capture heat on sunny days and retain the heat radiating from the ground at night. Frost and cold protection fabric protects plants from frost kill during unexpected late cold snaps and unseasonably early ones.

Landscape covers for Weed Control:

A development in Agro textiles is a special synthetic material used with mulches for weed control. These fabrics retard the weed growth by acting as a barrier between mulch and soil. It also permits the exchange of air and water between the atmosphere and the soil. It reduces watering requirement allowing nutrients to permeate and lends insulation to root system against sudden temperature change. These fabrics are easy to lay and cuts down on garden maintenance. It is available in 50, 70 or 100 GSM and is made of spun bonded polypropylene non woven fabrics.

Insect Proof Fabrics:

Insect control netting prevents damage from pests to the plants and gives a way to safeguard the vegetables and plants without disturbing the climate. These fabrics are UV stabilized woven fabrics made from high density polyethylene (HDPE), polypropylene or polyester and possess a suitable mesh size to keep away pests while allowing water, air and light to reach the fruits. It blocks most insects like aphids, potato beetles, Japanese betels, grasshoppers, leaf miners, cabbage worms, root maggots etc and result in higher yield due to decreased pest pressure. It also helps in breaking the cycle of pest infestation and removes need for insecticides. These nets are reusable and can be used for multiple seasons. It is important to apply insect netting at proper time because if it is installed after the infestation has occurred even if infestation is not visible, it will not solve the pest problem.

Rain Protection Fabrics:

These fabrics are used in the areas of heavy rainfall especially to protect the fragile flowers and berries from getting damaged from rainfall. These are made of grid structure to serve the main purpose of saving from rain.

Bio Barriers:

Bio Barriers are root control systems which prevent adjacent structures from damage by root. It is used vertically and deflects roots as its nodules slowly release Trifluralin preventing root tip cell division. Prevention of root growth results in healthier trees. It is placed besides the object to be protected and the roots growing into the zone are redirected while roots outside the zone continue to grow normally; tree health is not impacted since Trifluralin is not systemic. Since the system includes a standard drainage fabric, Biobarrier allows water, air and nutrients to pass through, not adversely affecting soil hydrology. Though its most common use is along the hardscapes to prevent damage from roots, it is also used inside larger pots as it prevents roots from growing through drain holes and attaching to native soil. Also in the case of removal of trees, less labour is required for harvesting and less damage is caused to the roots. It also prevents weed growth as weeds are unable to develop a strong root system in the mulch layer while ornamental tree and shrub roots expand unimpeded below the Trifluralin emitting fabric layer, eliminating unwanted competition and maintenance cost.

Root Pruning fabrics:

These fabrics have special application in nurseries or in hydroponics and results in healthier roots which are able to provide more nutrients to the plant. Usage of these fabrics result in trapping of roots by the porous fabrics and when these root tips come in contact with air outside the pot, they are naturally pruned. This pruning process forces lateral branching of fibrous feeder roots which are more productive in the uptake of water and nutrients. As a result, plants are more healthier utilizing the entire root zone for optimum plant growth.

It is important that enough awareness regarding benefits of agro textiles is created to increase its usage. Apart from crop production, agro textiles are also used in water management field like for drip irrigation and sprinkler irrigation system and for lining of ponds to prevent seepage and evaporation. Low density polyethylene films having thickness of 100- 250 microns are used for this purpose made by co- extrusion blown film technique. Research is undergoing to use knitted net hose for water transportation, use of water retention nets coated with super absorbent polymer resins and composites of hemp or polypropylene for reducing soil pollutants and other similar developments which have the potential to improve crop efficiency and cost effectiveness of farming.

Conclusion

Studies suggest that there is possibility of 10-40 % loss in crop production due to climate change in next 30 years. Steps need to be taken to prevent this loss and increasing usage of agro textiles can help in improving the efficiency of agriculture. Efforts need to be made to decrease cost to bring the prices at par with international supply chain. With proper steps, next green revolution will occur with the help of agro textile technology.

References

Agrawal, K.S. (2013) Application of textile in agriculture, International Journal of Advance Research in Science and Engineering, 2(7) 9-18.

Ajmeri, J and Kellie, G. (2016) Advances in Technical Nonwovens: Development in non-wovens as agrotextiles, Chicago. Woodhead Publishing, pp 48-69.

Basu, S.K. (2011) Agricultural and horticultural applications of agro textiles, Indian Textile Journal, 121 (12) pp 141-148.

Bhatt P, Rani A, Gehlot M and Bhandari V (2019) Recycling and Reuse of Agro textiles Used in Agricultural Farms, International Journal of current Microbiology and applied sciences, 8(6) pp 1566-1576.

Choi, W. (2005) New Product Development and its Application in Textiles, Journal of Textile and Apparel, Technology and Management 4(4) pp 1-26.

Chowdhry, J. J, Shamima, N and Faruque A (2017) Significance of Agro-Textiles and Future Prospects in Bangladesh, European Scientific Journal, 13(21) 139-154.

Deshpande T (2017) State of Agriculture in India, PRS Legislative Research, www.prsindia.org. Retrieved on 08.07.2020.

Kapila P (2019) Crop management through Agro Textiles, Textile Value Chain (March) pp 23-25.

Kapoor R, Mohanta, R and Agrawal, Y (2017) Agro Textiles, An Overview, fiber2fashion.com, retrieved on 21.03.2020.

Marasovic P and Kopitar D (2019) Overview and perspective of nonwoven agrotextile, Textile Leather Review, 2 (1) pp 32-45.

Paul P and Sanyal P (2012) Scopes of vegetable fibers in technical textiles sector, Souvenir of Institute of Jute Technology Re-Union: pp 66- 70.

Paul P, Sanyal P and Gon D (2012 a) Application of natural fibers in agro textiles, http://www.indiantextilejournal.com, retrieved on 21.03.2020.

Sankhe, M and Chitnis, R.S (2002) Textile structures and their application in agriculture, Indian Textile Journal, CXIII(3) pp 22-23.

Subramaniam, V, Poongodi, R.G and Veena, V (2009) Agrotextiles: Production, properties and potential, http://www.indiantextilejournal.com retrieved on 21.03.2020.

Strategies for Promoting Farmer Producer Organisations (FPOs) in India

G. Jaya[1], S. B. Ramya Lakshmi[2], K. C. Gummagolmath[3] and R.S. Bhawar[4]

Abstract

The present study investigated different facets of FPOs promoted by NABARD and SFAC. Both primary and secondary data has been used for the analysis. The study revealed that NABARD has supported around 4000 FPOs across the country which cover 2157 are registered entities. On the other hand, SFAC has promoted around 897 FPOs of which more than 835 have already been registered as legal entities. The findings of the study revealed that the number of farmer members who became shareholders in FPOs are marginally higher in the case of NABARD (878157) compared to shareholders of FPOs promoted by SFAC (846039). Thus, it is revealed that NABARD has promoted more number of FPOs than SFAC. However, average number of members per FPO is higher in the case of SFAC (1013.22) than that of NABARD (407.11). An opinion survey was conducted among different stakeholders of FPOs promoted by both the agencies. About 70-90 per cent of the members opined that the payments from FPC were received regularly. About 15-20 per cent of the members opined that the price for the produce given by FPCs is higher than traditional market prices and improvement in the employment opportunities due to the intervention of FPOs. Thus, establishing basic business principles within farming communities through FPOs intervention would bring industry and agriculture closer together and boosts rural development.

Keywords: Agricultural Marketing, Agribusiness, Farmer Producer Organizations, Farmer Producer Companies, Farmer Cooperatives, India

---

[1] Deputy Director (HRD), National Institute of Agricultural Extension (MANAGE), Hyderabad -500030. Corresponding Author Email : gjaya@manage.gov.in
[2] Consultant, National Institute of Agricultural Extension (MANAGE), Hyderabad.
[3] Director, National Institute of Agricultural Extension (MANAGE), Hyderabad.
[4] Consultant, National Institute of Agricultural Extension (MANAGE), Hyderabad.

Receiced Date: 26-06-2020 Accepted Date: 29-01-2021

Introduction

Agriculture has been an important component of India's economy and more so in rural areas for centuries and contributes around 13 per cent to the GDP. Acceleration of growth in the agricultural sector remains a key policy concern in India, since growth in agriculture is crucial to the livelihood of millions of rural poor. It is also pertinent to know that for achieving 8 per cent of growth in Indian economy, agriculture should grow at 4 per cent. Close to 86 per cent of farmers in our country are small and marginal farmers (Agricultural census, 2015-16). Any development strategy in consideration should be able to address the specific issues pertaining to these resource poor farmers.

Non- remunerative prices, low productivity, poor knowledge base towards production technology, access to credit, input, market and the under-par adoption behavior are the main issues that our farmers face. Due to small quantity available for marketing and resultant low bargaining power, most of our small and marginal farmers are in the clutches of market intermediaries. It reduces the producers' share in consumer's rupee and limits the price realized by the primary producers to the lowest possible in the supply chain (Venkattakumar and Sontakki, 2012). It is a much discussed topic that how to integrate the farmers, especially the small and marginal farmers, with the value chain so that we can ensure a reasonable return for their time, effort and capital.

One of the best instruments under the inclusive growth in promoting rural vibrancy in agriculture production is by aggregation of the small holders into FPOs to have a level playing field with large farms in terms of accessing land, water, inputs, credit, technology and markets. The group approach also reduces the transaction cost by inducing economy of scale. In the past, several attempts have been made for aggregating the small farmers in the form of cooperatives, SHGs, FICs, CIGs etc. However, the success achieved was limited and these institutions were dealing with only a part of supply chain.

In the recent past, the instrument of farmer producer organization, registered under Companies Act, is emerging as the most effective tool of aggregation. These producer companies are designed in such a manner that they are professionally managed and are able to take care of total supply chain. A producer company is basically a group of farmers registered as a producer company under Companies Act, 1956 (As amended in 2002). An amendment in Company's act 1956 was done during 2002 to add a corporate muscle to agricultural cooperatives so that it can bring effective management and good

governance. The same provisions have been retained for FPC after re-visiting the Companies Act, in 2013. (FPO policy and process guidelines, 2013).

The main aim of the formation of FPC is to establish basic business principles within farming communities, to bring industry and agriculture closer together, and to boost rural development (Kumar Sharma, 2008) by collectivization of the farmers especially small and marginal farmers to address the challenges faced by farming community (Alho, 2015; Valentinov,2007; Kyriakopoulos et al., 2004). This concept allows farmers to obtain their independence and to improve their position of power within the production system and offers better scope for income enhancement through cost saving and efficient use of inputs, also facilitates the better crop planning, crop insurance and integrating them with knowledge sources. With these advantages, the formation of "Farmer Producer Companies" is gaining momentum in recent past in India.

Against this backdrop, an attempt has been made in the present study to analyze different facets of FPOs promoted by NABARD and SFAC and to elucidate the opinion of members, Board of Directors, functionaries and officials involved in the promotion of FPOs on different aspects.

Objectives of the Study

1. To have a comparative analysis of the schemes being implemented by SFAC and NABARD.
2. To understand the strengths and weaknesses of each model of implementation and to suggest measures to overcome the weaknesses.
3. To assess the impact of aggregation of farmers by different agencies on their Socio-economic aspects.
4. To suggest appropriate strategies for promoting farmers organization on a large scale throughout the country.

Methodology

The study was conducted using both primary and secondary data. The primary information has been collected from a total sample of 150 stakeholders using well-structured schedules and through personal interview method from five different states viz., Maharashtra, Assam,

Telangana, Madhya Pradesh, and Karnataka representing different regions of the country. These schedules were prepared by covering different aspects of implementation of FPOs and their impact on different stakeholders. The secondary information was collected through review of literature, interaction with the subject experts, focus group discussion, brainstorming and case analysis.

i. Sampling Design

A total of 150 different Stakeholders dealing with FPOs were covered, as mentioned in Table 1

Table 1: Sampling Method

Sl. No	Stakeholders	Maharashtra	Telangana	Madhya Pradesh	Karnataka	Assam	Total
1	SFAC						2
2	NABARD						2
3	Resource Institutions	1	1	1	1	2	6
4	Promoters of FPOs	2	2	2	2	2	10
5	No. of FPO Directors (9)	9	9	9	9	9	45
6	FPOs office bearers (1)	1	1	1	1	1	5
7	Members of FPOs	14	14	14	14	14	70
8	Legal advisers facilitating formulation/registration of FPOs	1	1	1	1	1	5
9	Experts in the field of FPOs	1	1	1	1	1	5
	Total Sample Size						**150**

the improved sericulture technologies. Nevertheless the study depicts that the farmers in the study area have not been utilizing the complete resources available with them and adoption of integrated pest management and integrated nutrient management is not Mattigatti R., Dolli S. and Lyengar M.N.S.(2001). 'Model Co-operativeMarketing System for Sericulture : A Strategy for Development, Global Silk Scenario, published by Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1996, P. 178.

ii. Statistical Tools: The socio-economic profile of the members was analyzed by calculating mean and in order to study the impact of FPOs on farmer members simple percentages were worked out.

Results and Discussion

1. Status of FPO's Promoted by NABARD AND SFAC

The comparative analysis of the FPOs promoted by different agencies, revealed that NABARD, along with FPCs is promoting other forms of aggregation model such as farmers club, cooperatives, watershed groups and SHGs. On the other hand, SFAC is exclusively promoting FPCs since initiation of the scheme. Due to presence of country wide network, NABARD is able to promote more number of FPOs compared to SFAC (Table-2).

The number of farmer members who became shareholders in FPOs are marginally higher in the case of NABARD (878157) compared to shareholders of FPOs promoted by SFAC (846039). Thus, it reveals that NABARD has promoted more number of FPOs than SFAC. However, average number of members per FPO is higher in the case of SFAC (1013.22) than the NABARD (407.11). This may be due to diverse and small size model of aggregation followed by NABARD unlike SFAC (Table 2).

Table 2: State-wise Registered FPOs by NABARD (August 2019), SFAC (February, 2020) and Other Agencies

Sl. No	State	No. of Districts	NABARD		SFAC		NON-SFAC (Co-operatives)	NRLM	Self Promoted
			No. of FPOs	No. of Share holders	No. of FPOs	No. of Share holders	No. of FPOs	No. of FPOs	No. of FPOs
1	Andaman and Nicobar	2	3	314	0	0	0	0	0
2	Andhra Pradesh	13	95	45098	8	8715	6	1	1
3	Arunachal Pradesh	1	1	103	2	2050	0	0	0
4	Assam	17	40	13636	12	9331	25	0	0
5	Bihar	32	117	37511	29	36306	0	5	2
6	Delhi	0	0	0	4	3535	0	0	0
7	Chhattisgarh	15	57	24210	26	29616	0	7	1
8	Goa	1	2	104	2	1810	0	0	0
9	Gujarat	22	118	36295	20	20875	14	2	6
10	Haryana	17	50	24984	23	14049	1	0	0
11	Himachal Pradesh	9	51	10194	6	6528	0	0	0
12	Jammu and Kashmir	10	13	1548	2	6814	0	0	0
13	Jharkhand	22	127	41848	10	12009	0	11	0
14	Karnataka	27	161	74932	120	122907	0	3	3
15	Kerala	14	131	51637	0	0	0	4	2
16	Lakshadweep	1	1	50	0	0	0	0	0
16	Madhya Pradesh	36	160	74675	144	138118	0	44	1
17	Maharashtra	20	119	38879	100	100845	0	11	20
18	Manipur	5	8	3116	7	5671	00	0	1
19	Meghalaya	6	9	1409	3	2990	0	0	0
20	Mizoram	7	16	3266	1	1700	0	0	0
21	Nagaland	1	5	1094	2	1750	0	0	0
22	Odisha	28	100	47570	41	38622	0	25	0

23	Punjab	20	70	8450	7	6288	0	0	0
24	Rajasthan	28	143	51814	50	58670	0	12	0
25	Sikkim	1	4	856	30	16279	0	0	0
26	Tamil Nadu	31	170	122032	13	14657	52	0	21
27	Telangana	19	68	22884	21	29225	34	8	1
28	Tripura	1	1	80	4	2874		0	0
29	Uttar Pradesh	43	116	43076	55	55936	178	0	3
30	Uttarakhand	13	52	17550	7	6004	38	0	1
31	West Bengal	18	150	79022	86	91865	0	2	0
	Total	479	2157	878157	835	846039	348	135	63

Farmer Producer Companies (FPCs) promoted by SFAC & NABARD

FPOs in India are mainly promoted by the Government of India through two apex agencies viz., SFAC and NABARD. There are some basic differences in their approach followed for implementation of FPOs by each organization.

Farmer Producer Companies (FPCs) promoted by the NABARD

NABARD as a nodal agency provides technical, managerial and financial support for hand-holding, capacity building and market intervention to the Producer Organizations. Such support is available in the form of grant, loans, or a combination of the two based on the needs of FPOs and is available only to those POs which avail credit from NABARD. NABARD also provides support to the POs to access markets for their produce through credit and/or grant support for setting up of marketing infrastructure facilities. For promotion of FPOs, NABARD identifies the experienced Resource Institutes and Producers Organizations Promoting Institutions (POPIs) and supports these institutions in delivering the designated responsibilities for formation and effective implementation of the FPOs.

NABARD also provides incentives for the POPI for taking care of the PO within the overall ceiling of 20 per cent grant support to the FPOs. Apart from these, NABARD provides cash incentives i.e., 5 per cent of loan amount for POs up to 5 years old and 2.5 per cent of loan amount for FPOs more than 5 years old. This incentive is given in a phased manner i.e., 10 per cent of the total incentive amount in advance, 70 per cent linked to timely repayment of instalments and rest 20 per cent at the end subject to satisfactory repayment of loans by FPOs.

Farmer Producer Companies (FPCs) promoted by SFAC

SFAC provides all- round support to State Governments and other entities engaged in promotion and development of FPOs. SFAC has empaneled qualified and experienced Resource Institutions (RIs) which includes NGOs and State govt. agencies. The main objectives of these RIs include cluster identification, perform diagnostic study, feasibility analysis, baseline assessment, business planning, mobilization of the farmers, organizing and formalizing groups, training of the members in resource mobilization, management system development, business operations and assessment and auditing of FPOs. In addition to RIs, SFAC has empaneled the consultants at state level and are mandated to extend support at various levels for the formation of the FPOs. As of now, about 3-4 RIs in each state are identified and empaneled in 28 states. RIs and Consultants are the connecting points to the FPOs and other stakeholders. The financial benefits, technology support, capacity building supports is extended to FPOs from SFAC which are routed through RIs and Consultants placed at state level.

Comparative Analysis of Modalities of SFAC & NABARD for Formation of FPOs

The promoting agencies viz., SFAC & NABARD are playing important role in promotion of the FPOs for the wellbeing of the farming community. There are some basic differences in the approach followed for implementation of FPOs by each organization. NABARD is utilizing its own funds available under Producer Organization Development Fund (PODF), while, SFAC has to facilitate the process of development of organizing farmers on the request of states utilizing funds available under schemes like Rashtriya Krishi Vikas Yojana (RKVY), funds provided by MOA&FW under NFSM. NABARD has the advantage of having state level and regional level offices and experience of working with farmers. On the other hand, SFAC has advantage of following a comprehensive system of developing farmer companies well supported by other schemes like equity funds and credit guarantee. The quantum of funds per FPOs is also relatively higher for organizations being promoted by SFAC. However, lack of presence at state level has been expressed as a major limiting factors in approaching SFAC. There are various other differences related to institutional framework, ground level coordination, model funds availability, and the same are presented in the Table 3

Table 3. A Comparative Statements of both the Models

Sl. No.	Particular	SFAC	NABARD
1	Approach	Bottom-up, based on the priorities of the government	Top down approach, based on its own plans
2	Scheme/Fund	Farmer Producer Organization Schemes	Producers Organization Development Fund
3	Funds availability	don't have its own funds & depends o funds and grants	Own funds
4	Mobilisation	15-20 group of FIG at village level and federated at central level	700-1000 member farmers /group
5	Focus	Agriculture and allied activities	Agriculture, allied sectors & off farm sector
6	Support for	Technical support, training, research, knowledge management, linkages for investment, technology, market and extension	Credit support, capacity building & market Intervention, technical, managerial and financial support
7	Presences	Head office in Delhi and no regional office	Network of regional offices with Head office in Mumbai
8	Ground level coordination	By networking with resource institutes in the state	Through regional offices and district officers
9	Experience	No direct experience of organising farmers	Having experience of organising farmers at grass root through institutions like CIG, SFG, etc

Sl. No.	Particular	SFAC	NABARD
10	Model	Two-tier approach, farmers group like commodity interest group become members of producer company	Individual farmer-producer may become the members of farmer organisation
11	Total funds per FPO	Rs 35.26 lakhs (excluding RI funding)	Rs 21.60 lakhs (including RI funding)
12	Funds exclusively for FPO Development	Rs 20.08 lakhs	Rs 7.80 lakhs
13	Support period	3 years	3 years
14	Mode of support	* Support to Resource Institutes (RIs) * Matching grants * Credit guarantee	* Loans (Soft Loans) * Grants (Equity Grants and Credit Guarantee Funds)

Source: Compiled by MANAGE, GOI 2019

Sources of Funds and Funding Pattern

FPOs promoted by NABARD and SFAC are governed by two set of separate schemes. NABARD is promoting FPOs through its 'Producers Organization Development Fund (PODF)' and dedicated fund "PRODUCE" of Rs. 200 crore provided by Government of India for supporting financial/ non-financial component to Producers' Organizations mainly to facilitate improved access to credit, ensure adequate capacity building, market linkages and need based handholding services. NABARD has made a provision of grants of Rs. 21.6 lakh per group irrespective of models. This assistance is spread over a period of five years. In addition to this, NABARD has created subsidiary called NABKISAN Finance Ltd. for meeting the credit requirements of FPOs envisaging flexible norms and, provides promotional support towards capacity building, market linkages and other incubation

services to FPOs. Besides, it is also providing the need based grant assistance through refinancing to the banks to extend finance to the FPOs. It has also created a digital platform for on-line submission of loan applications.

In the case of SFAC, funds are provided by Ministry of Agriculture and Farmers Welfare under RKVY programme. SFAC has made a provision of Rs.35.26 lakh per group for the formation and development of the FPOs. In addition to that, SFAC has taken initiative to provide support to the equity base of FPCs by providing matching equity grants and Credit Guarantee Support for facilitating collateral free lending to FPCs to enhance viability, sustainability and increasing credit worthiness and also to enhance the shareholding of members to increase their ownership and participation in their FPC. SFAC provides maximum equity grant support of Rs. 10.00 lakh on condition of minimum shareholder membership of 50 farmers.

Socio-economic Profile of Sample Respondents in the Selected FPOs

Table 4 reveals that the members of the farmers organizations considered under the study are middle aged in both the cases. Farmer-members are having an average education of 8 - 9 years. Main occupation of the members is agriculture and the subsidiary occupation is dairy, fertilizer, input shops and flower business. In the case of farmers organizations supported by SFAC, majority of the members are small and marginal farmers having landholding less than 3 acres, whereas, in the case of NABARD promoted FPOs farmers with large landholdings are in higher proportion which may be due to promotion of FPO in a cluster of villages.

The average income of farmer-members considered under the study is in the range of 2.00 lakhs with members of NABARD promoted farmers organizations doing relatively better than SFAC promoted organizations. This may be due to the relatively larger size of landholdings of the farmers included in the NABARD promoted Farmers Organizations. The farmer's organizations are rendering services mainly confined to input distribution, advice on technology, capacity building and marketing of the produce (Table 4). The components like value addition and transportation facilities to integrate the produce with better markets have been adopted only by a few organizations.

Table 4. Profile of the Member Farmers Associated with the FPOs Promoted by NABARD and SFAC

Sl. No.	Particular	NABARD	SFAC
1	Average. Age	43.39	42.57
2	Avg. Education in Yrs.	8.32	9.71
3	Avg. Landholding size (in acers)	6.9	2.90
4	Average Annual income (in lakhs)	2.19	1.71
	Cropping pattern		
1	Kharif	Cotton, Tur, Paddy, Maize, Tomato, Green peas	Soybean, Paddy, Red gram Maize, Vegetables, Sugar cane, Grapes and Sapota, Cotton
2	Rabi	Wheat, black gram	
3	Summer	Vegetables	

Impact of Holding Membership in the FPOs on the Profile of the Farmers

Impact of FPOs membership on the profile of farmers-members is presented in Table 5. Member farmers opined that the yield performance increased considerably in the range of 10-20 per cent in SFAC promoted FPOs. Whereas, some members of farmers organizations promoted by NABARD also suggested an enhancement of yield to the tune of 50 per cent. Majority of the member farmers opined that FPOs promoted by both the agencies are rendering services in input trading, technical advice, capacity building and marketing the agricultural produce. Whereas services such as transportation of the produce, access to credit, value chain management have not been paid sufficient attention.

Table 5: Impact of Holding Membership in the FPOs on the Profile of the Farmers

Sl. No.	Crop Performance Indicator		
	Particulars	**NABARD**	**SFAC**
1	Yield increased by (in %)	5-50	10-20
	Services rendered (in %)		
1	Input trading	100	100
2	Technical Advice	100	95.23
3	Capacity building	92.85	85.71
4	Value chain management	17.85	19.04
5	Marketing of the agri produce	78.57	90.47
6	Transportation of the produce	25	61.90
7	Access to credit	39.28	19.04
	Inputs prices at FPC lower (in %)		
1	Seed	-6.25	
2	Fertilizers	-14.25	-8.57

It was also observed that, in the case of NABARD promoted FPOs, the farmers procured the inputs like seeds and fertilizers at a price lower by 6.25 per cent and 14.25 per cent respectively than the market price. Whereas, the farmer members in SFAC promoted FPOs purchased fertilizers at a lower price of 8.57 per cent than the market price. However, it is a welcome note that FPOs promoted by both the agencies are able to reduce the cost of inputs, unlike conventional sourcing of inputs.

Qualitative Impact of FPOs Promoted by Different Agencies on Socio-economic Status of Farmer members

From the Table 6, it can be observed that the member-farmers have opined that vertical integration of farmers under different farmer-organizations have helped in improving the quality of produce at least in terms of quality parameters specified by the organizations for

better market integration. Payments were made regularly as opined by 70 - 90 percent members. Farmer-members also opined that aggregation has helped them in having access to assured markets, helped improve quality of their produce and improve bargaining power. It also emerged from primary survey that prices given by organizations for sale of agri-produce is higher than traditional markets price. Marketing cost has declined for farmer-members of the selected FPOs and in some cases dividends are being disbursed to the farmer members.

Member-farmers also felt that the initiative has helped them in improving their living standard, purchasing power, and nutrient intake after becoming member in FPC. About 75 and 33 per cent members of FPOs promoted by NABARD and SFAC respectively were aware about business plans/strategies planned for their organization. Some of the members also reported that the construction of infrastructure like storage structures and grading equipment from the business profits of the FPOs. Members were also convinced that introduction of the concept of FPOs has helped in improving the employment opportunities and establishing backward and forward linkages for better supply of inputs and marketing the produce (Table-6).

Table 6: Qualitative Impact of FPOs Promoted by Different Agencies on Socio-economic Status of Farmer Members (%)

Sl. No.	Particulars	NABARD	SFAC
1	Field visits by the FPC officials	Fortnightly/ monthly	Monthly
2	Company specifies quality parameters for trading the commodity at FPC	21.41	33.33
3	If the produce is not in conformity, the company rejects the produce	20.14	28.45
4	Payments from FPC received regularly	75	95
5	Quality improvement of the produce	85	96
6	Price given for your product by FPC is higher than traditional markets (in %)	2-15	5-20

7	Improvement in living standard	100	100
8	Improvement in purchasing power of commodities	100	100
9	Dividends are disbursed to the member farmers	25	19
10	Assured markets for their produce	82	85
11	Reduction in production and marketing cost	21.42	23.80
12	Nutrition status of the member family increased after becoming member in FPC	100	100
13	Awareness about business plan/strategies adopted by FPC	75	33
14	Aware of legal compliances	85	89
15	Social capital built from the business profits	7.14	9.5
16	Bargaining power of the member farmers increased	96	98
17	Improvement in backward and forward linkages for marketing of the Produce	17.85	19.04
18	Additional employment generated	21.42	28.57

Opinion survey of Directors and CEOs of FPOs

As per the field level observations, it was found that the job role of directors is not clearly defined and the contribution of the BOD to the FPCs is not to the expected level. The directors lack proper vision and expressed their inability to provide desired direction to the company due to lack of awareness on their roles and responsibilities. Yet, the contribution of directors in the case of organization promoted by SFAC was found to be relatively better, which may be due to presence of comprehensive structure under the provisions of Companies Act., 2013. The convergence with the other institutions and government schemes was found to be good in the case of farmers organizations promoted by NABARD. This may be due to presence of NABARD offices at grass root level. Majority of the directors opined that the handholding support is not extended to the expected level.

Most of the CEOs suggested that the scope of organizations are confined only to few activities. On marketing front, FPOs are trying to link farmers with buyers. The price realized by the farmers of FPOs are better compared to the prices prevailing in traditional markets. Legal compliance was another challenge expressed by the CEOs. The CEOs are found to be aware of the legal compliances such as filing of Income Tax returns, auditing reports, proceedings of meeting conducted, GST and other trade related compliances. However, they expressed their limitation in understanding operational part of the same compelling them to take services from external agencies. It emerged from the discussion that legal compliance has become complex and expensive affair for FPOs to follow. The major factors curtailing the performance of farmer's organizations as expressed by the CEOs of the FPOs covered under the study are lack of funds and human resources and poor access to the credit. Better access to capacity building and higher participation of the farmers coupled with dynamic leadership may help to achieve the goal of sustainable and financially viable farmer's organization in long-run.

SWOT Analysis of FPOs Promoted by NABARD

Strengths	Weaknesses
● NABARD has the merit of existence of grass root level network and regional offices. ● Multi model approach for promotion of FPOs and thus able to promote more number of FPOs ● Dedicated subsidiary - NABKISAN for credit support.	● NABARD has the merit of existence of grass root level network and regional offices. ● Multi model approach for promotion of FPOs and thus able to promote more number of FPOs ● Dedicated subsidiary - NABKISAN for credit support.

Opportunities	Threats
● The concept has emerged and initiated by NABARD till recently ● Capacity building of stakeholders including CEOs of FPOS can be carried out by using its institutional mechanism. ● It can make use of part of its reserve fund for supporting FPOs and thus has flexibility to support FPOs for many activities	● Minimum attention on Promotion of FPOs due to other mandates ● Lack of awareness among member about the NABARD scheme ● Absence of specific guidelines for extending credit support to FPOs.

SWOT Analysis of FPOs Promoted by SFAC

Strengths	Weaknesses
● Higher limits for Equity guarantee and Credit guarantee fund and collateral free/ loans ● Provision for Project Development Facility fund and Venture Capital Assistance (VCA) ● Priority is given for the formation of the homogenous groups of FPOs	● Absence of Institutional mechanism at grass root level ● Lack of own funds and reserves for promotion of FPOs ● Support confined only to FPOs registered under Producer Companies Act

Opportunities	Threats
● Strong funding support system with collateral free loan	● Cap on benefits of Equity Grant & Credit Guarantee Fund schemes availed by FPOs having a membership of 500 or more
● Development of relationship with ground level agencies	● Complete dependence on the empaneled consultants/ RIs at regional level
● Integration with other components like equity match grant and credit guarantee	● Cumbersome procedure to avail benefits & support by FPOs

Recommendations and Conclusion

Some of the recommendations based on the findings of the study to successfully implement the concept of aggregation of farmers to take advantage of scale are presented inthis section.

- ***Simple aggregation Model*** **–** Simple model consisting of 100-300 farmers preferably in the cluster of villages may be promoted on the lines of FIGs. The model should have simple registration process involving minimum legal compliance. Tenant farmers to be organised through models like Joint Liability Groups (JLG) to extend benefits of different scheme to them as well
- ***Promoters*** – The concept need to be promoted not only by government agencies like SFAC and NABARD but also by private players like bulk buyers, processing, input suppliers, organized retailers and big corporate houses. ATMA platform may be leveraged for scaling –up of formation of FPOs due to its presence in all the districts and its linkage with all the line departments.
- ***Uniform funding*** – The pattern of funding followed by SFAC and NABARD is different in terms of support available to producer company and Resource Institutes. These anomalies in funding will lead to learning of promoting agencies towards source of higher funding. Hence, there is a need for uniform funding pattern among all the agencies.

- ***Sources of Funds*** – SFAC may be provided with sufficient funds for formation of farmer-organization. Besides, on the lines of NABARD, SFAC may be supported to have its network at the regional level. For this purpose, there is a need to restructure organizational set up of SFAC by providing adequate manpower and funds to have its network at least at state level.

- ***State Level Agency*** – There is need for a state level agency to cater to different requirements of FPO Program. The agency will collaborate with different state departments and funding and implementing agencies. The state will be the single window for interaction of the different stakeholders with the government agencies and other knowledge institutions. State Agricultural and Management and Training Institutes (SAMETIs) may be used as a nodal agency for this purpose.

- ***Focus on quality production*** - Though the concept FPO envisages solutions for problems in marketing of agriculture produce, yet in the process, these agencies should not lose the focus on production aspects. Hence, at the farmers level, emphasis should be given for quality production, optimum use of technology and resources and to have a proper mix of farm and non –farm activities to provide sustainability. Crop planning at FPOs level should be as per the market demand, buyer's requirements and should have traceability elements to cater to international trade also.

- ***Platform for delivery of inputs and extension services*** - FPOs can be used effectively for establishing backward linkages for effective delivery of services like inputs supply, information dissemination, bank linkages and delivery of extension services. FPOs on account of their structure may help member-farmers perform different activities more efficiently for these purposes. Taking up input and extension based activities will not only help farmers in producing more efficiently but also help the organizations earn margins and profits mainly in initial years. Gradually, the farmer organizations may start taking up marketing related activities and may be connected on to business entities. FPOs have the potential to develop themselves in to professional agencies by performing all the activities envisaged in the policies for formation of FPOs.

A comprehensive coverage of farmers organization model with linkages with both market and extension services

- ***Access to credit*** – Access to credit will play a crucial role for investments in creation of infrastructures required for production, post-harvest management, processing, value addition and marketing. Once the FPOs attain maturity stage in their business, an appropriate credit policy for creation of required infrastructures assumes significance. Hence government, may come up with FPOs specific loan products and credit support policies for this purpose.
- ***Evaluation*** – FPOs need to have a comprehensive evaluation system consisting of their financial health and impact on member-farmers in term of income, diversification, market integration, access to extensions services, etc. This approach will also help in using this as a platform to take various benefits like credit, insurance, inputs, etc to the farmers which otherwise are not available to many farmers like land-less tenants.
- ***Continuous support*** – The financial support available under different schemes need to be made uniform over a longer period of time. This support may be based on the review of the performance of the organizations.
- ***Appropriate model for farmer's aggregation*** – The aggregation of illiterate and resource poor farmers under a complex system having legal and tax implication may need attention. There is need for simple model on the lines of FIG or cooperatives with limited responsibility and legal compliance to help farmers come together and have better access to inputs, extension services and linkage with market and bulk buyers.
- ***Capacity Building –*** A comprehensive strategy for capacity building of all stakeholders at different level needs to be in place. Institutes like MANAGE and NIAM at national level and SAMETIs at state level may be roped in for capacity building at Training of Trainers (TOT) level.

- ***Leveraging farmers organization for extension services delivery*** - The farmer organization may be linked with different agencies for efficient delivery of technology and extension services, backward linkages coupled with market-led extension services

Conclusion

The study concludes that to some extent farmers organizations have helped in overcoming many challenges faced by small holders. However, there exists huge potential to reap benefits from FPOs in long run. Hence, there is a need for comprehensive strategy for capacity building at all levels so that each stakeholders can clearly understand their role and responsibilities. Observations have also suggested the need for having a proper provision to facilitate participation of large number of small and marginal farmers. The structure should also help in having focus not only on forward linkages with the market but also on quality of primary production. Therefore, there is need to establish linkages of farmers organizations with knowledge centers to help them diversify their activities towards marketing, value addition etc. Poor access to resources and services like extension, credit, etc has also emerged as an important factor limiting progress of farmer's organizations. These organizations, operating at a small scale mainly during the initial years and being managed by limited human resources have found to be facing legal compliance which are complex and expensive in nature. Hence, there is need to revisit the policies and programs designed for promotion and implementation of FPOs across the country. A harmonized, well laid organizational structure with efficient management of different activities in the total supply chain is required to make the concept successful and sustainable.

References:

Agricultural census: All India report on number and area of operational holdings, 2015. http://agcensus.nic.in/document/agcen1516/T1_ac_2015.16. Pdf

Eeva Alho, (2015). Farmers' self-reported value of cooperative membership: evidence from heterogeneous business and organization structures. Agricultural and food Economics.

FPO policy and process guidelines, 2013. Dept. of Agriculture and Cooperation Ministry of Agriculture, Government of India

Kumar Sharma, G., 2008. Producer Companies: Facilitating producers to do business in a better way. Network. Institute of Rural Management Anand (IRMA), Anand.

Kyriakopoulos et al., (2004). The impact of cooperative structure and firm culture on market orientation and performance. Agribusiness, volume 20, issue-4, Pages 379-396. https://doi.org/10.1002/agr.20021.

Michael L. Cook and Brad Plunkett, (2006). Collective Entrepreneurship: An Emerging Phenomenon in Producer-Owned Organizations. Journal of Agricultural and Applied Economics .Volume 38, Issue 2 August 2006, PP.421-428.

Valentinov, (2007). Why are cooperatives important in agriculture? An organizational economics perspective. Journal of Institutional Economics, 32(1), 55-69.doi: 10.1017/s1744137406000555.

Venkattakumar R and B S Sontakki (2012) Producer Companies in India- Experiences and Implications. Indian Research Journal of Extension Education. Special Issue (Volume I), January, 2012 pp: 154-160.

Factors Influencing Crop Diversification in Tirunelveli District of Tamil Nadu

Mohammed Ghouse L[1] and S. Nazreen Hassan[2]

Abstract

This paper analyzes the factors influencing crop diversification in Tirunelveli district of Tamil Nadu. Crop diversification is nothing but a shift in cropping pattern, shift from traditionally grown less benefit crops to more benefit crops to increase the income as well as agricultural sustainability. To cope up with the risk arise due to mono cropping, crop diversification can be used as a better strategy. It reduces the risk to farmer from total crop failure by providing alternative means of income through other crops grown. It also helps in conservation of natural resources, increases food and nutritional security and helps in poverty alleviation by providing employment opportunities to the farmers. We studied about the factors influencing crop diversification in Tirunelveli district of Tamil Nadu using the primary data. Non - Experimental Research design was used for this study purpose. A sample size of 120 respondents was fixed for the study using proportionate random sampling technique. Out of twenty two variables selected for the study, variables viz., Family size, Distance to the market, Economic motivation, Risk orientation, Innovativeness and Scientific orientation had positive and significant association with crop diversification at one per cent level of significance.

Keywords: Crop diversification, Intensive farming, Sustainable Agriculture, Tamil Nadu, India.

Introduction

Indian agriculture facing distress due to disparities in the income of the farmers and non-agricultural workers. To overcome this problem, Government of India set a goal for doubling

[1] Pg scholar, Department of Social Sciences, Agricultural College and Research Institute, Killikulam, Tamil Nadu, India. Corresponding Author Email : lmdghouse95@gmail.com

[2] Assistant Professor, Krishi Vigyan Kendra, Thiruppathisaram, Kanyakumari, Tamil Nadu, India

Received Date: 06-08-2020 Accepted Date: 09-08-2020

the income of farmers by 2022-2023. Crop diversification can be used as a better strategy to achieve this goal and to reduce the disparities in income of the farmers and non-agricultural workers. The aim of crop diversification is to grow more number of crops in a given area such that the farmer may not depend on a single crop. Risk may be reduced by growing more number of crops than growing single crop. Introducing variety of crops also leads to increase in production as well as agricultural sustainability. In India, small farm sizes characterizes agriculture. The average farm size is about 1.57 ha. About 93 per cent of the farmers have farm size smaller that 4 ha. They contribute about 55 per cent of total cultivable land. Only 1.6 per cent of farmers having farm size of more than 10 ha and they contribute about 17.4 per cent of total cultivable land. After Green revolution, there is continuous rush for diversified agriculture in terms of crops. Indian agriculture shifted towards non-cereal crops in order to increase the income and agricultural sustainability. It reduces the risk to farmer from total crop failure by providing alternative means of income through other crops grown. It also helps in conservation of natural resources, increases food and nutritional security and helps in poverty alleviation by providing employment opportunities to the farmers. In this paper an attempt was made to study the factors influencing crop diversification in Tirunelveli district of Tamil Nadu.

Objective:

To study the factors influencing crop diversification among the selected respondents.

Review of literature:

Cho et al. (2016) found that farming experience, farm size, access to irrigation and distance to the market were the variables found to have positive effect on crop diversification and significant, while age of household head was found to be significant but had negative effect on crop diversification respectively.

Lawin et al. (2017) concluded that age of farmers, education level of farmers and distance to market were the variables found to be significant and had positive effect on crop diversification, while family size was found to be significant but had negative effect on crop diversification.

Sichoongwe et al. (2014) observed that farm size and distance to market were found to be significant and had positive effect on crop diversification, while age of farmers was not significant and had negative effect on crop diversification respectively.

Kankwamba et al. (2012) reported that gender and education level of farmers had negative effect on crop diversification, while family size of farmers had positive effect on crop diversification.

Benin et al. (2004) found that education level of farmers had negative effect on crop diversification respectively.

Joshi et al. (2004) revealed that education level of farmers and distance to the market were the variables found to have positive effect on crop diversification.

Minot et al. (2006) observed that education level of the farmers had positive effect on crop diversification respectively.

Van Dusen and Taylor (2005) found that family size of the farmers found to have negative effect on crop diversification.

Aneani et al. (2011) reported that family size, farming experience and farm size of the farmers had negative effect on crop diversification.

Ashfaq et al. (2008) and Rahman (2008) found that farming experience of the farmers was found to be significant regarding diversification of crops respectively.

Mithiya et al. (2018) found that farm size and per capita income of the farmers were found to have positive effect on crop diversification, while access to irrigation had negative effect regarding crop diversification.

Aheibam et al. (2017) reported that farm size of the farmers were found to be not significant towards crop diversification respectively.

Basavaraj et al. (2016) revealed that farm size, irrigation, house hold income and access to market were the variables found to be determinants of crop diversification.

Kasem et al. (2010) found that the labour forces of the farmers were found to be not significant and had negative effect on crop diversification respectively.

Birthal et al. (2005) stated that irrigation facilities of farmers was found to be not significant regarding crop diversification.

Ibrahim et al. (2009) found that distance to market was found to be significant and had positive effect on crop diversification respectively.

Materials and Methods:

The study was based on the primary data collected among the selected respondents. A sample size of 120 farmers was fixed as respondents. The 120 respondents were identified from the selected six villages from three blocks by applying proportionate random sampling method. A list of 22 independent variables that could possibly influence the crop diversification were prepared. The variables were Age (X_1), Gender (X_2), Educational status (X_3), Occupational status (X_4), Family size (X_5), Farming experience (X_6), Farm size (X_7), Annual income (X_8), Labour availability (X_9), Area under diversification (X_{10}), Source of irrigation (X_{11}), Distance to the market (X_{12}), Social participation (X_{13}), Information source utilization (X_{14}), Decision making (X_{15}), Economic motivation (X_{16}), Risk orientation (X_{17}), Innovativeness (X_{18}), Scientific orientation (X_{19}), Credit orientation (X_{20}), Attitude of farmers towards crop diversification (X_{21}) and Trainings undergone (X_{22}) .

To find out the degree of relationship between the variables and crop diversification Pearson's product moment correlation co-efficient was calculated. It was calculated by using the following formula.

$$r = \frac{\sum xy - \frac{(\sum x)(\sum y)}{n}}{\sqrt{\left(\sum x^2 - \frac{(\sum x)^2}{n}\right) \times \left(\sum y^2 - \frac{(\sum y)^2}{n}\right)}}$$

Where,

N	-	Sample size
$\sum xy - (\sum x)(\sum y)/n$	-	Sum of product of x and y
$\sum x^2 - (\sum x)^2/n$	-	Sum of square of x
$\sum y^2 - (\sum y)^2/n$	-	Sum of square of y

The 't' test of significance was used to test the significance of the 'r' value, using the formula.

$$t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}} \sim t_{(n-2)}df$$

Where,

n - Sample size

r - Correlation co-efficient value

Results and discussions:

Correlation analysis was performed to find out the association of independent variables with crop diversification. The results are presented in the table 1.

Table 1. Association of Profile Characteristics with Crop Diversification

S. No	Characteristics	Coefficient of correlation (r)
1.	Age	0.085^{NS}
2.	Gender	-0.0151^{NS}
3.	Educational status	0.042^{NS}
4.	Occupational status	-0.055 ^{NS}
5.	Family size	0.646**
6.	Farming experience	-0.078 ^{NS}
7.	Farm size	0.026 ^{NS}
8.	Annual income	-0.047 ^{NS}
9.	Labour availability	0.108 ^{NS}
10.	Area under diversification	0.008 ^{NS}
11.	Source of irrigation	0.127 ^{NS}
12.	Distance to the market	0.333**

13.	Social participation	0.045 NS
14.	Information source utilization	-0.147 NS
15.	Decision making	-0.149 NS
16.	Economic motivation	0.297**
17.	Risk orientation	0.252**
18.	Innovativeness	0.307**
19.	Scientific orientation	0.438**
20.	Credit orientation	0.059 NS
21.	Attitude of farmers towards crop diversification	-0.041 NS
22.	Trainings undergone	0.139 NS

*Significant at 0.005 level **Significant at 0.001 level NS - Non significant

It could be seen from the table, where the correlation value of the variables, family size (X_5), distance to the market (X_{12}), economic motivation (X_{16}), risk orientation (X_{17}), innovativeness (X_{18}) and scientific orientation (X_{19}) had positive and significant association with crop diversification at one per cent level of probability.

The rest of the variables age (X_1), gender (X_2), educational status (X_3), occupational status (X_4), farming experience (X_6), farm size (X_7), annual income (X_8), labour availability (X_9), area under diversification (X_{10}), source of irrigation (X_{11}), social participation (X_{13}), information source utilization (X_{14}), decision making (X_{15}), credit orientation (X_{20}), attitude of farmers towards crop diversification (X_{21}) and trainings undergone (X_{22}) showed non-significant association with crop diversification.

Conclusion:

The overall assessment showed that out of twenty two variables, six variables viz. family size, distance to the market, economic motivation, risk orientation, innovativeness and scientific orientation had positive and significant association with crop diversification at one per cent level of probability. This clearly evident that these factors influence farmers to practice crop diversification. There existed a medium level of expression from among

the farmers with the psychological variables like Economic motivation, Risk orientation, scientific orientation and Credit orientation. These are the factors that directly influence adoption. This indicates the need for an integrated extension effort to motivate the farmers to go for improved diversification practices. It was also found that most of the farmers had medium level of innovativeness and medium level of Information source utilization which shows that efforts can be made to intensify extension efforts by narrowing down the farmers' extension ratio in the state department.

References:

Cho, A., Tun Oo, A., & Speelman, S. (2016). Assessment of household food security through crop diversification in Natmauk township, Magway Region, Myanmar. In Tropentag 2016. Conference on International Research on Food Security(pp. 1-5).

Lawin, K. G., & Tamini, L. D. (2017). Risk preferences and crop diversification amongst smallholder farmers in Burkina Faso (No. 1910-2017-1299).

Sichoongwe, K., Mapemba, L., Ng'ong'ola, D., & Tembo, G. (2014). The determinants and extent of crop diversification among smallholder farmers: A case study of Southern Province, Zambia (Vol. 5). Intl Food Policy Res Inst.

Kankwamba, H., Mapila, M. A. T. J., & Pauw, K. (2012). Determinants and spatiotemporal dimensions of crop diversification in Malawi. Project Report produced under a co-financed research agreement between Irish Aid, USAID and IFPRI, Paper, (3).

Benin, S., Smale, M., Pender, J., Gebremedhin, B., & Ehui, S. (2004). The economic determinants of cereal crop diversity on farms in the Ethiopian highlands. Agricultural Economics, 31(2?3), 197-208.

Joshi, P. K., Gulati, A., Birthal, P. S., & Tewari, L. (2004). Agriculture diversification in South Asia: Patterns, determinants and policy implications. Economic and political weekly, 2457-2467.

Minot, N. (Ed.). (2006). Income diversification and poverty in the Northern Uplands of Vietnam (Vol. 145). Intl Food Policy Res Inst.

Van Dusen, M. E., & Taylor, J. E. (2005). Missing markets and crop diversity: evidence from Mexico. Environment and Development Economics, 10(4), 513-531.

Aneani, F., Anchirinah, V. M., Owusu-Ansah, F., & Asamoah, M. (2011). An analysis of the extent and determinants of crop diversification by cocoa (Theobroma cacao) farmers in Ghana. African Journal of Agricultural Research, 6(18), 4277-4287.

Ashfaq, M., Hassan, S., Naseer, M. Z., Baig, I. A., & Asma, J. (2008). Factors affecting farm diversification in rice-wheat. Pak. J. Agri. Sci, 45(3), 91-94.

Mithiya, D., Mandal, K., & Datta, L. (2018). Trend, pattern and determinants of crop diversification of small holders in West Bengal: A district-wise panel data analysis. Journal of Development and Agricultural Economics, 10(4), 110-119.

Aheibam, M., Singh, R., Feroze, S. M., Singh, N. U., Singh, R. J., & Singh, A. K. (2017). Identifying the determinants and extent of crop diversification at household level: an evidence from Ukhrul District, Manipur. Economic Affairs, 62(1), 89.

Basavaraj, N. D., Gajanana, T. M., & Satishkumar, M. (2016). Crop diversification in Gadag district of Karnataka. Agricultural Economics Research Review, 29(347-2016-17228), 151.

Kasem, S., & Thapa, G. B. (2011). Crop diversification in Thailand: Status, determinants, and effects on income and use of inputs. Land Use Policy, 28(3), 618-628.

Birthal, P. S., Joshi, P. K., & Gulati, A. (2005). Vertical coordination in high-value commodities: Implications for smallholders (No. 596-2016-40047).

Stakeholders' Integration in Sorghum and Sesame Seed Supply System. The Case of West Gondar Zone, Amhara Region, Ethiopia

Birhanu Melesse [1], Tewodros Getnet[2], Yenesew Sewnet[1], and Beyene Derso[3]

Abstract

Sesame and Sorghum are the major crops that are widely used for consumption and marketing purposes. However, the attention given for seed production and supply is low in these crops and it does not meet the growing demands of the farmers in the west Gondar zone, even various actors and stakeholders are involved in sesame and sorghum seed production and dissemination activities. Hence, the study tried to assess stakeholders' integration in Sorghum and Sesame seed supply system and identify the challenges of the Sesame and sorghum seed supply system in the study area. The research adopts a cross-sectional survey design that combines both qualitative and quantitative research approaches. To select the study area and respondents, a multi-stage sampling technique was used. In the first stage, Metema and Quara districts were selected purposively due to their potential for sorghum and sesame production. At the second stage, two kebeles were selected from each district purposively based on their potential for Sesame and Sorghum production. At the last stage, a total of 88 sample stakeholders were selected by using a simple random sampling technique. Data analysis was carried out by using descriptive statistics like frequency, mean, and standard deviation. The survey result indicates that the integration of stakeholders in the major activities (Problem identification, planning, implementing the activities, monitoring, and evaluation of the activities and documentation of best practices) and specific activities was not satisfactory. Hence, the stakeholders should work in an integrated manner to improve the seed supply system of sesame and sorghum ultimately addresses the problem of duplication of efforts in the study area.

Keywords: Seed Production, Seed Industry, Seed Supply Chain, Sorghum, Sesame, Ethiopia.

---

[1] Bahir Dar University, College of Agriculture and Environmental Sciences, Department of Rural Development and Agricultural Extension, Corresponding Author Email : birhanumelesse4@gmail.com

[2] University of Gondar, College of Social Sciences and Humanities, Department of Development and Environment Management Studies

[3] University of Gondar, College of Agriculture and Environmental Sciences, Department of Rural Development and Agricultural Extension

Received Date: 07-08-2020 Accepted Date: 14-08-2020

Introduction

Background and Justification of the Study

The seed is a key input for production of any agricultural and horticultural commodities. Increasing the quality of seeds can increase the yield potential of the crop by significant folds and thus, is one of the most economical and efficient inputs to agricultural development (FAO, 2006). Generation and transfer of improved technologies are critical prerequisites for agricultural development particularly for an agrarian-based country like Ethiopian (CSA, 2010).

In Ethiopia, different Seed systems are operating. The formal and the informal system (sometimes called local or farmers seed system). In the recent years, the idea of an intermediary seed system has appeared in the Ethiopian seed sector. The intermediary seed system combines attributes of both the formal and the informal seed systems (Hassen and Dessalegn 2011). The Ethiopian formal sector is made up of institutional operations associated with the development of improved varieties, multiplication, processing, storage and distribution to farmers. Specifically, this includes research institutions, public seed enterprises, large private corporations, and small private seed enterprises. On the other hand, in the informal sector, farmers select their crops and local landraces/varieties, produce their seeds, and/or locally exchange and purchase seeds. Although the formal seed sector started about six decades ago, it remains limited to a few major crop varieties developed by agricultural researchers. As a result, the informal sector remains the major supplier of the seed of improved and local varieties for many crops grown by small-scale farmers (ATA, 2015).

The seed demand is increasing rapidly due to growth in agricultural sector. Thus, securing the supply of quality seed is the most effective way to sustain food security in Ethiopia (Atilaw, 2010). To satisfy the seed demand, improved variety seeds are supplied particularly by public organizations: public seed enterprises, agricultural research institutes, and universities (Alemu 2011; Thijssen et al. 2008). The participation and coordinating role of public entities are quite high in Ethiopia as compared with other sub-Saharan African countries (ISSD Africa 2012). Private seed producers also supply seed to the market. Projects are designed to increase seed production and distribution by strengthening the public and private sectors and also promoting community-based seed production strategies

(Alemu 2010; ATA 2015). However, both public and private seed producers mainly concentrate on a few cereal crops, particularly hybrid maize and bread wheat. Moreover, they supply only a small portion of the total quantity of seed demanded by farmers. Studies show that only a small area of land has been covered by improved seed. According to Atilaw and Korbu (2011), between 2005/6 and 2009/10, only 3.5 percent of the land was planted with improved seed out of a total of 12 million hectares of land under major food crops. Moreover, seed suppliers concentrate only on a few crops and cannot address the diversified seed demand of the farming community(Bishaw and Louwaars, 2012). Thus, they do not satisfy the diversified seed demand of farmers.

Although, Sesame and Sorghum are the major crops that are widely used for consumption and marketing purposes. However, the attention given for seed production and supply is low and it does not meet the growing demands of the farmers in the west Gondar zone. This indicates that there are different factors directly or indirectly influencing the input supply system that believed to boost production and productivity of the smallholder farmers. But the reasons why the input-supplying system failed to satisfy the requirements of the farmers are not analyzed so far in the study area.

Various actors and stakeholders are involved in sesame and sorghum seed production and distribution activities. All these actors and stakeholders, in one way or the other, contribute to the production, promotion, supply, and marketing of improved sesame and sorghum seed varieties in the country as well as in the study area. These include research institutes, public and private seed companies, cooperative promotion offices, agricultural offices, seed-related projects, financial institutions and Non-governmental organizations (NGOs) (Alemu 2011; Hassena et al. 2013). These stakeholders are expected to perform different activities in an integrated manner. However, previous researches did not attempted to analyze the integration of stakeholders in the sesame and sorghum seed supply system. Hence, the study was initiated to analyze the stakeholders' integration in Sesame and Sorghum seed supply system in the study area.

Objectives of the Study

* To analyze the integration of stakeholders in Sorghum and Sesame seed supply system in the study area

* To identify the challenges of Sesame and sorghum seed supply system in the study area

Operational Definition of Terms

Seed system refers to the full set of activities and stakeholders involved in effectively developing, producing, and distributing seed to smallholder farmers.

Stakeholders refer to various groups, actors, organizations involved in Sesame and sorghum seed supply system activities

Research Methods

Description of the Study Area

West Gondar zone has four districts and three city administrations. It is located in the North-Western part of the country and far from the capital city Addis Ababa about 800km. The boundaries of the West Gondar Zone are North Gondar Zone and Tigray region to the North, Awi zone and West Gojam zone to the South, Central Gondar zone to the East and Sudan to the West. This study was conducted by taking samples from two districts from Western Gondar Zone.

Research Design

The study adopted a cross-sectional survey design which helps to collect data for more than one case at a single point in time. Both qualitative and quantitative research approaches were employed for the study. Quantitative data were obtained from household survey interviews. The qualitative data were obtained from the focus group discussion and key informant interviews.

Sampling Techniques and Procedures

A multi-stage sampling technique was applied to select sample districts, kebele, and respondents. In the first stage, Quara and Metema Districts were selected from West Gondar zone purposively, due to researchers' prior information about the Sesame and Sorghum seed supply system in the area. In the second stage, two kebeles from each district (Bambaho and Dubaba from Quara district and Shinfa and Kokit from Metema

district) were selected purposively depending on their potential to sorghum and sesame production by consulting the district's agriculture office. In the last stage, a total of 88 sample respondents were selected from the stakeholders using a simple random sampling technique in proportion to their sizes.

Stakeholders	Sample respondents		Total
	Metema district	Quora district	
Agriculture Professionals	16	10	26
Farmers	16	16	32
ATA	1		1
Researchers	2		2
Cooperative officers	6	5	11
Private input suppliers	7	2	9
ACSI officers	4	3	7

Data Sources and Methods of Data Collocation

Data Sources

The data were collected from both primary and secondary sources. Primary data were collected through stakeholders' interviews and Focus Group Discussion (FGD). Secondary data were collected from government annual reports, zonal and district agricultural office and research office annual reports, and research results undertaken in similar areas.

Methods of Data Collection

To gather the required data for this study, various data collection instruments were used. These include; interview schedule for household survey, Checklist for Focus Group Discussion (FGD) and interview guide for key informant interviews. The interview schedule consists of close-ended questions which were used as data collection instrument. This instrument was used to collect data for demographic and social variables. The interview schedule was prepared in English and translated into the local language (Amharic). Before collecting the actual data, pilot testing was conducted for correction based on the feedback

obtained from the test. The training was arranged for enumerators to familiarize themselves with the interview schedule. Through household survey, data were collected from 88 stakeholders, Focus Group Discussion (FGD) was also conducted with 12 participants to generate additional data and complement the data obtained through the household survey.

Methods of Data Analysis

The collected data were analyzed with the support of SPSS software version 20 software. Descriptive statistics like frequency, mean, and standard deviation were used to analyze the demographic and social characteristics of the respondents. To measure the perception of different stakeholders, Likert scale statements were used and analyzed using frequency and percentages. On the other hand, the qualitative data were analyzed through narrations and descriptions.

Limitation of the Data Analysis

The study employed simple descriptive statistics to analyze the data due to the nature of stud. As a result, the advanced quantitative data analysis models were not executed. Performance of the stakeholders integration were also not examined by the appropriate data analysis methods.

Results and Discussion

Demographic and Social Characteristics of Respondents

The educational level of the respondents indicated in Table 1. Among the total respondents, 29.3% of them fall under can read and write whereas 2.3% under cannot read and write category. Respondents in the first, second and third cycle (high school) make up about 11.4 per cent and 4.5per cent of the total respondents. On the other hand, 20.5% and 31.8%fall under diploma and first-degree category respectively. The educational level distribution of the respondents followed the pattern where the majority of the respondents fall in diploma and the first-degree category. This is due to the data collected from different stakeholders in the study area.

The sex distribution of the respondents in Table 1 shows that about 87.5 per cent of the respondents were male while the remaining (12.5%) were female. It was observed that the majority of the respondents were male while small proportions of them are female respondents. About the age distribution of the respondents, it was observed that the maximum age was reported 58 years and the min was 23 years with 35.03years average age.

Table1: Education Level, Sex and Age of Respondents

Variables	Category	Frequency	Percentage
the education level of respondents	Cannot read and write	2	2.3
	Can read and write	26	29.5
	Grade 1-8	10	11.4
	grade 9-12	4	4.5
	Diploma	18	20.5
	First Degree and above	28	31.8
	Total	88	100.0
sex of respondent	Female	11	12.5
	Male	77	87.5
	Total	88	100.0

Variable	N	Minimum	Maximum	Mean	Std. Deviation
age of respondent	88	23.00	58.00	35.0341	8.27467

Source: Survey Data 2017/18

Stakeholders' Participation in Major Activities

Key stakeholders that were categorized into the seed supply system of Sesame and Sorghum in the study area includes Gondar Research Center, Office of Agriculture, Cooperative Unions, Cooperative promotion Office, Amhara Saving and Credit Institute, Amhara Seed Enterprise, Farmers Seed Multiplication Cooperatives, Sesame Business

Network (SBN), Agricultural Growth Program (AGP), Agricultural Transformation Agency (ATA), Farmers, and private input suppliers. Thus, a total of 12 stakeholders were identified who have been involved in Sesame and Sorghum seed supply in the study area. It was expected that these stakeholders have to perform different activities in an integrated manner. In this regard, stakeholders' participation in the major activities of Sesame and Sorghum seed supply, were assessed using five statement items. They were asked to rate the level of integration concerning problem identification, participation in planning, implementation, monitoring, evaluation, and documentation of best practices. The results of the survey in Table2 indicate that 37.5 per cent, 37.5per cent, 40.1per cent, 44.3per cent, 33per cent of the sample respondents expressed their integration in planning, implementation, monitoring, evaluation activities was poor. On the other hand, 44.3per cent, 39.8per cent, 30.7per cent, 36.4per cent, 40.9per cent of the sample respondents expressed their integration in planning, implementation, monitoring, and evaluation activities were good. Besides this, 26.1per cent and 44.3per cent of the respondents expressed their integration in documentation of best practices was very poor and poor respectively. The overall average result of the different statements in relation to stakeholders integrations revealed that the integration was poor.

Table 2: Stakeholders' Participation in Major Activities of Sesame and Sorghum Seed Production and Supply.

S.No	Major activities	Very Poor	Poor	Good	Very Good	Excellent
		%	%	%	%	%
1	Problem identification	9.1	37.5	44.3	8	1.1
2	participated in the planning phase	4.5	37.5	39.8	17	1.1
3	Participated in implementing the activities	12.5	40.1	30.7	12.5	3.4
4	Participated in monitoring of the activities	11.4	44.3	36.4	3.4	4.5
5	Participated in evaluation of the activities	10.2	33	40.9	11.4	4.5
6	documentation of best practices	26.1	44.3	20.5	8	1.1
7	Average	12.3	39.45	35.4	10.05	2.6

Source: Survey Data 2017/18

The focus group discussion result held with stakeholders also indicates that stakeholders have been participating in a variety of trial, seed multiplication, demonstration, seed supply, providing skill gap trainings, provision of loan and financial support services. In this regard, Gondar Research center has been working a variety trial and demonstrate the result in the farmer's plot. A similar study conducted by Alemu 2011; Hassen et al. 2013 shows that research institutes work for variety development, adaptation, multiplication, and pre-extension demonstration. Variety adaptation and demonstration are practical means of improving the crop variety portfolios of SPCs (Thijssen et al. 2013). However, the FGD participants confirmed that variety trial activities were not carried out by conducting need assessment. Because of this, the variety trial does not incorporate the variety and seed demands of farmers in the study area. It was indicated that the variety of trial activities carried out in the farmers' plot lacks basic record keeping and feedback mechanisms. The FGD participant from the research center confirmed that they did not know whether the farmers are using the result or seed or food. On the other hand, the research center has distributed the Basic seed for Amhara Seed Enterprise, Cooperative Unions, Farmers and (SBN) which is obtained from the variety trial. The research center has arranged different pieces of training for staff members of the Metema district Cooperative Union, Metema district agriculture office, Metema district Cooperative promotion office, and farmers. They also arranged Field day to scale-out best practices with seed supply in the study area. The research center has been currently working with the district agriculture office in the following specific activities: the selection of kebeles, farmers, farmers plot, demonstrating best practices, and in arranging field days.

On the other hand, Cooperative Unions, Cooperative promotion Offices and Amhara Saving and credit institutions have been providing saving and credit services which directly supporting the existing seed supply system in the study areas.

Apart from this, ATA, AGP, SBN, ISSD are governmental and non- governmental organizations working in the study area to improve the productivity of sesame and sorghum by providing financial support for purchasing sesame and sorghum improved seeds and enhance the technical capacity of different stakeholders by arranging trainings and demonstration sessions. For example, SBN is providing improved seed of sesame to the farmers in the study area. It also provides credit for selected multipurpose cooperatives in which farmers can get credit through their cooperatives.

In the Metema district, ISSD has been supporting Work Amba Farmers seed multiplication cooperative which is found in Kokit Kebele of Metema district by constructing warehouse and furnishing their office, providing basic seed and financial support. This seed multiplication cooperative is the only seed multiplication cooperative responsible for seed multiplication in the district. However, the FGD participants told us it is not well organized due to the lack of appropriate farmland established on a cluster bases. Hence, the members need clustered land for seed multiplication. However, the district Environmental protection office, land administration office, and cooperative promotion did not secure clustered land for the members. The study result indicates that the seed supply system requires the commitment of stakeholders. Despite the increased demand, the seed sector supplies a limited quantity of Sesame and Sorghum seed to the farmers. A study conducted by ISSD, 2016 indicates that seed producer cooperatives play a key role in the Ethiopian seed sector. For example, in 2014 alone, more than 23 different crops and 131 varieties were produced by SPCs. In the study area, Melkam (Sorghum variety) and Aba Sena, Gondar 1 (Sesame varieties) are largely available. The problem may be due to poor integration of stakeholders that can be revealed from the survey and FGD result.

Challenges concerning Seed Supply System in the Study Area

The respondents' perception of the challenges for integration of stakeholders in Sesame or sorghum seed supply system was measured in five statement items and the result indicated in Table 3. Respondents were asked to express their level of agreement whether Lack of interest, lack of awareness about seed supply, Lack of Trusted seed sources, Lack of credit access and Poor communication among stakeholders were challenges to seed supply of Sesame and Sorghum. Accordingly, 28.4per cent, 33 per cent, 34.1per cent, 27per cent, 34.1 per cent of the respondents disagree with the stated statements. On the other hand, 37.5%,30.7%, 43.2per cent, 30.7per cent, 22.7per cent of the respondents partially agree with the stated statements. Unlikely, 30.7per cent and 37.5per cent of the respondents partially agree and agree with Poor selection, distribution, storage mechanism was a challenge in the seed supply system in the study area.

Table 3: Level of Agreement of Respondents about the Challenges of Seed Supply System in the Study Area

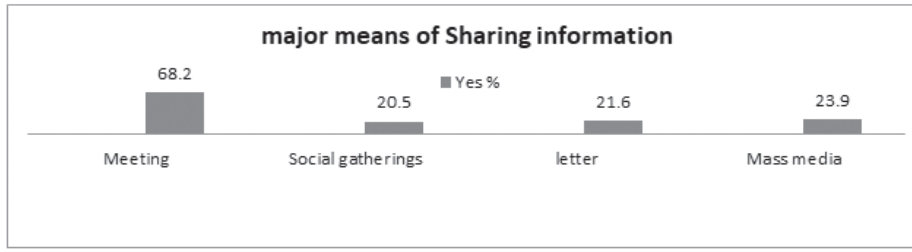
No.	challenges of stakeholders in Sesame and sorghum seed supply system	Strongly disagrees %	Disagree %	Partially agree %	Agree %	Strongly agree %
1	Lack of interest to exchange information	15.9	28.4	37.5	12.5	5.7
2	Lack of awareness about seed supply	14.8	33	30.7	13.6	8
3	Lack of Trusted seed sources	12.5	34.1	43.2	5.7	4.5
4	Lack of credit access	10.2	12.5	27.3	19.3	30.7
5	Poor communication among stakeholders	5.7	20.5	34.1	22.7	17
6	Poor selection, distribution, storage mechanism	5.7	12.5	30.7	37.5	13.6

Source: Survey Data 2017/18

Means of Sharing Information by the stakeholders

Communication enables Stakeholders to transfer, share, and use information that available when it is required. Stakeholders in the study area have been using different ways of knowledge and information sharing techniques. According to the survey results, 68.2 per cent of the respondents confirmed that they have been using the meeting to share information, 23.9 per cent mass media, 21.6per cent letters and 20.5per cent social gatherings based on the frequency of contact and sources of information. Information can be also disseminated and shared through the delivery of various sources such as training, field days, demonstrations, experience sharing, market.

Figure 1: Means of Sharing Information



Source: Survey Data 2017/18

Conclusion and Recommendations

Conclusion

The study was designed to analyze the integration of stakeholders in the Sorghum and Sesame seed supply system and identify the challenges of the Sesame and sorghum seed supply system in the study area. To achieve these objectives, a household survey from 88 sample respondents, 12 focus group discussion participants to collect data from Metema and Quara districts. The data were analyzed and discussed using appropriate statistical techniques (descriptive statistics). Based on the survey result, it can be concluded that stakeholders' integration in major activities (Problem identification, planning, implementing the activities, monitoring, and evaluation of the activities and documentation of best practices) were found to be poor. The survey result also indicates that lack of interest to exchange information, lack of credit access, poor communication among stakeholders, lack of trusted seed sources, poor selection, distribution, storage mechanism are hindering the integration of stakeholders in the study area. Since, smallholder farmers are the ultimate users of sesame and sorghum seed, and therefore a participatory approach is critical in all stages and sectors of the seed system.

Recommendations

* The results of the study indicate that stakeholders' integration in Problem identification, planning, implementing the activities, monitoring, evaluation of the activities and documentation of best practices is not *satisfactory. Hence,* the stakeholders should

work in an integrated manner to improve the seed supply system of sesame and sorghum ultimately address the problem of duplication of efforts in the study area.

* Lack of interest to exchange information, lack of credit access, poor communication among stakeholders, lack of trusted seed sources, poor selection, distribution, storage mechanism were identified as the major challenges hindering the integration of stakeholders in the study area. Hence, the stakeholders need to work hard to address the existing challenges to improve the seed supply of Sesame and Sorghum.

* The FGD result confirmed that a variety trial activities were not carried out based on the needs of rural farming community. Hence, to consider the needs of farmers, the Gondar Research center should conduct a variety need assessment in the study area.

* The existing Seed multiplication cooperatives should be strengthened and additional Seed multiplication cooperatives should be organized for addressing the seed supply shortage in the study area. Hence, the district Environmental protection office, land administration office, and cooperative promotion office should work together to strengthen Work Amba Seed multiplication cooperative.

Acknowledgments

Authors would like to acknowledge the University of Gondar for funding this research project. The researchers are also acknowledged Metema and Quara Agricultural Offices for their facilitation of the research activities.

References

Alemu, D. (2010). Seed system potential in Ethiopia: Constraints and opportunities for enhancing the seed sector. International Food Policy Research Institute.

Alemu, D. (2011). Farmer-based seed multiplication in the Ethiopian system: Approaches, priorities, and performance. Future Agricultures Working Paper 036.

Agricultural Transformation Agency (ATA). (2015). Seed system development strategy: Vision, systemic challenges, and prioritized interventions. Ethiopian Agricultural Transformation Agency (ATA). Working strategy document, Addis Ababa, Ethiopia.

Atilaw, A., and L. Korbu. (2011). The recent development in seed systems of Ethiopia. In Improving farmers' access to seed empowering farmers' innovation. Series No. 1, edited by D. Alemu, S. Kiyoshi, and A. Kirub, 13-30. Addis Ababa, Ethiopia: JICA.

Bishaw, Z., Y. Sahlu, & B. Simane. (2008). The status of the Ethiopian seed industry and the role of the Ethiopian Seed Enterprise. In: Farmers' seeds and varieties: supporting informal seed supply in Ethiopia. 23-33. Wageningen: Wageningen International.

Bishaw, Z., and N. Louwaars. (2012). Evolution of seed policy and strategies and implications for Ethiopian seed systems development. In Defining moments of the Ethiopian seed sector, edited by A. T. Wold, A. Fikre, D. Alemu, L. Desalegn, and A. Kirub, 31-60. Addis Ababa, Ethiopia: Ethiopian Institute of Agricultural Research.

Central Statistical Authority of Ethiopia (CSA). (2005-2010). Annual Agricultural Sample Survey Report. Addis Ababa, Ethiopia.

Food and Agricultural Organization (FAO).(2006). Crop and Food supply assessment mission to Ethiopia

Hassen, M., and L. Dessalegn. (2011). Assessment of the Ethiopian seed sector. Paper presented at the African seed and biotechnology program: Integrated Seed Sector Development in Africa workshop, Kampala, Uganda.

Hassen, M., T. Dessalegn, F. Abay, and M. H. Thijssen. (2013). Participatory varietal selection for enhancing farmers' access to quality seed in Ethiopia. In Community Biodiversity Management-promoting resilience and the conservation of plant genetic resources, edited by W. S. De Boef, A. Subedi, N. Peroni, M. T. Thijssen, and E. O'Keeffe, 279-84. New York, USA: Earthscan, Routledge.

Integrated Seed Sector Development (ISSD). (2012). ISSD Africa-Ethiopian seed systems assessment. ISSD Briefing Note-ISSD Assessment Ethiopia, Wageningen UR, Wageningen, The Netherlands.

Integrated Seed Sector Development (ISSD). (2016). Program on integrated seed sector development in Ethiopia. 2015 annual report. Wageningen: Centre for Development Innovation, Wageningen UR, Wageningen, The Netherlands.

Thijssen, M., Z. Bishaw, A. Beshir, and W. S. De Boef. (2008). Farmers, seeds and varieties: Supporting informal seed supply in Ethiopia. Wageningen, The Netherlands: Wageningen International

Access and Utilization of Agricultural Extension Services among Rural Ethiopian Women

Birhanu Melesse[1]

Abstract

The review paper analyzed factors affecting access and utilization of agricultural extension service among rural Ethiopian women. The objective of this paper was to review factors affecting access and utilization of agricultural extension service. Secondary sources of data were used by reviewing the findings of different researchers on the research title. "Women comprise, on average, 43 percent of the agricultural labor force in developing countries. Agriculture sector has been the recognition that past efforts have failed in part because they overlooked women's role in the sector and the role of gender inequalities in reducing agricultural productivity. The following factors including age, marital status, income, and educational attainment as well as social categories such as ethnicity and gender influence the abilities of technicians to deliver the knowledge they have and the willingness and capacity of producers and processors to make use of the services offered influence that men and women farmers have on the content of agricultural extension services and the manner in which it is delivered. In general, strengthening women's skills is essential to enable women to participate in agricultural extension service and articulate their extension needs.

Keywords: Agricultural Extension, Agricultural Extension System, Extension activities, Women Farmers, Ethiopia.

Introduction

Background of the Paper

Agriculture is recognized as a fundamental driver of economic growth and poverty reduction for many developing countries and a priority area for investment. A characteristic of the

[1] Department of Rural Development and Agricultural Extension, College of Agriculture and Environmental Sciences, Bahir Dar University, Corresponding Author Email : birhanumelesse4@gmail.com

Received Date: 07-08-2020 Accepted Date: 25-08-2020

renaissance of the agriculture sector has been the recognition that past efforts have failed in part because they overlooked women's role in the sector and the role of gender inequalities in reducing agricultural productivity. According to the 2010-11 FAO report "The State of Food and Agriculture," "Women comprise, on average, 43 percent of the agricultural labor force in developing countries, ranging from 20 percent in Latin America to 50 percent in Eastern Asia and Sub-Saharan Africa" (FAO, 2011). The report argues that reducing gender inequalities in access to productive resources and services could produce an increase in yields on women's farms of between 20 percent and 30 percent, which could raise agricultural output in developing countries by 2.5 percent to 4 percent (FAO, 2011)

Realizing these gains requires men and women farmers to have access to the information, skills, and tools they need to improve their yields. This, in turn, requires reforming the institutions involved in the delivery of those services. A fundamental aspect of this process is recognizing that agriculture writ large, and specifically the processes of providing effective agricultural extension services, involve much more than technical solutions. Furthermore, the structure and policies of institutions that contribute to and influence agricultural development are also shaped by the values, behaviors, gender relations, and social norms of societies in which they are situated. Maximizing the benefits from agricultural growth for smallholder farmers and the economy at large depends on understanding these influences and designing programs that take them into account. These factors affect women's access and utilization of agricultural extension services (World Bank, 2009).

The gender equity dimension of agricultural extension service provision is an aspect that is widely addressed in the literature. From the global survey of 115 countries by FAO in the 1980s to the micro-studies by World Bank and introduced the Agricultural Knowledge information System approach. The Agricultural Knowledge information System perspective went a long way toward improving the inclusion of gender issues in general, and specifically in the research process and personnel policies. Despite the greater attention to gender issues, many of the constraints that impede women's ability to access extension services remained overlooked. For example, during this period, the possibility of paying for information, which had become the expectation in many advisory services, ignored the challenges that women producers and other disadvantaged groups face in generating income (World Bank, 2009).

Factors that stimulate innovative behavior" and "linkages and partnerships with a wide range of stakeholders along agricultural value chains, including the agribusiness sector". With an expanded set of stakeholders and variables, this emerging perspective embodies a more complete transition away from a simple "best practice" or one-size-fits-all approach toward the customized "best fit" application of service principles, based on assessment of contextual factors. Livelihoods approaches, integrated poverty reduction, natural resource management, and other rural development concerns have been brought into agricultural extension service with a broader and perhaps stronger impact than previous efforts. In both cases, the additional layers of focus have not always explicitly addressed gender dynamics. Nevertheless, women are now viewed as critical actors in agricultural development, and this recognition needs to translate into more equitably designed services and mechanisms for influencing extension policies and practices. Market linkages for producers have been strengthened within the agricultural extension service, but the need remains for even more substantive inclusion of women in such efforts. An explicit gender dimension is needed to adequately remove inequalities that impede women from becoming active agents in improving their livelihoods and those of their households (World Bank, 2009). Hence the objective of the this paper was to review factors affecting access and utilization of agricultural extension service of rural Ethiopia women.

Results and Discussion

Definition of Concepts

Agricultural Extension Service: Service provided to increase agricultural productivity of farmers

Access

Access implies the ability to use resources and /or benefits and to make short-term decisions on them. Access means the opportunity to make use of something. It has terms of use rights for women as daughters, wives, mothers, etc depending on their life cycle and gender relations. Women generally lack access and right to resources. They gain limited benefit from the fruits of their labor. In Africa women's access to land, agricultural labor (including women's labor itself), and modern agricultural inputs such as improved seeds, chemical fertilizer, pesticides, etc is very limited. Because; land, livestock, women and their labor are all known as the properties of men household heads, and these rights in

turn, obscuring women's role in the household, have enabled men to have access rights to the modern agriculture inputs. Women's access to resource needed for their work, their control over the resource to use as they wish, their access to benefit derived from family and personal work and to control they have over the benefit(MoWA and ABD, 2009).

Utilization

It is essentially implies the ability to use and even dispose of a resource or benefit, and impose one's definition upon the other actors is a situation.

Historical Overview of Agricultural Extension Services

Agricultural extension service for improving agricultural production dates back to ancient times, as evidenced in Mesopotamian clay tablets, Egyptian hieroglyphics, Greek and Roman writings, and Chinese texts. These recommendations from antiquity were targeted at the landed elite and their tenants to control the maintenance and improvement of their estates, and to enhance revenue and tax collections. The idea of an agricultural extension service per se emerged much later, in the mid-1800s, when the Earl of Clarendon and the Royal Agricultural Improvement Society of Ireland sought to spread knowledge about the cultivation of nutritious root crops to combat the Irish potato famine. Parallel developments emerged in many European countries, including Finland, Germany, Austria, and France. The biodynamic and organic agriculture movements and associated practices were widely disseminated in the early years of the 20th century. Visitors from Canada and the United States to Europe, in turn, brought back this concept to North America.

In the United States, the concept of combining research, teaching, and extension was institutionalized in the land-grant college model, which was strengthened by the passage of the Smith-Lever Act of 1914 and its authorization of federal funds for cooperative extension. It brought the results of university research to the local farmer, the latest in home economics to his wife, and eventually the 4-H model3 to their children. The establishment of national agricultural services in the newly independent states of the developing world during the 1950s and '60s led to expanded efforts to bring new agricultural knowledge to farmers. The approach was top-down and linear, a fashion generally inherited from colonial predecessors. It was not until economist published her groundbreaking work, Women's Role in Economic Development, building on ethnographic data, that significant attention in both academic and development communities focused on women's productive roles in agriculture. From that point forward, a growing body of literature

emerged, initially identifying the failure of development programs to incorporate women as producers and, eventually, exploring what approaches actually worked. The early "training and visit" extension systems, based on an efficiency model of transferring new technologies to farmers, did not effectively reach women farmers, small-scale producers (women or men), or farmers in some ethnic populations. Within the T&V system, women were largely viewed as beneficiaries, in a welfare sense, but not as actors in their own right in agricultural production. At the institutional level, this period marks the beginning of increased attention to gender issues within personnel policies, but gender imbalances remained a major inadequacy (World Bank, 2009).

Agricultural Extension Service in Ethiopia

Agricultural extension service in Ethiopia is said to have started in 1953 with the establishment of the then Imperial Ethiopian College of Agriculture and Mechanical Arts, currently known as Haramaya University. It was established following the concept of the land grant system of the United States of America and was mandated to have three responsibilities: teaching, research and extension. The extension mandate of the college included transferring local research outputs and technologies to farmers, and importing technologies and improved practices from abroad and introducing them to farmers (Ibrahim 2004). The college was using graduates of the then Jimma and Ambo agricultural high schools as development agents, and was concentrating its efforts around the areas where it had agricultural experimental stations. The college started with only 2 extension agents; this number later increased to 132 agents operating in 77 extension posts.

The extension service of the college undertook demonstrations, regular visits of individual farmer's fields and the organization of youth clubs. The youth clubs were used as entry (focal) points to disseminate technologies to the larger farm communities. Moreover, the extension service of the college focused on improved poultry production, horticulture, tree seedling production and distribution, improved wheat varieties, and apiculture. The coverage of the extension service of the college was minuscule compared to the needs of the country due to severe shortage of manpower and limitations in new/improved technologies. The lack of complementary institutional support services such as input supply and credit services was another major constraint of the extension service provided by the college. The fact that the extension service focused on training and knowledge transfer, with the responsibilities for input supply and rural credit being assigned to other bodies signifies the importance of treating the extension service only as a source of training and

information. However, institutions to supply inputs and credit to farmers are necessary compliments to the extension service, and their absence had a negative effect on the effectiveness of the extension service. In 1963, the mandate to provide agricultural extension was moved to the then Ministry of Agriculture, structured as a department at the national level and extension personnel assigned at provincial levels. However, the extension service was not very active until 1968, even compared with the extension activities of the college (Ibrahim, 2004). The Third Five Year Development Plan (1971-74) had aimed to modernize the Ethiopian agriculture through a comprehensive package approach to be initially implemented in selected pilot areas and eventually to be scaled up to cover.

The Derg regime, which toppled the Imperial regime in 1974, continued with the four years, although the implementation of the project was constrained by political instability and changes in the government structure.

Demonstration and Training Extension System was started in 1995. It became the first extension program to be developed without foreign assistance and fully funded by the government budget (Ibrahim, 2004). It aimed at increasing productivity and production of smallholders, empowering farmers to be active participants in the development process, increasing food self-sufficiency, increasing the supply of raw materials for domestic use and export, enhancing the rehabilitation and conservation of natural resource base, and encouraging farmer organizations.

Ethiopia, presents a significant global challenge to agricultural development with a complex gender dimension (Mogues et al. 2009; Fafchamps and Quisumbing 2005; Bishop-Sambrook 2004). Using a uniquely designed dataset to capture gender dimensions in agriculture contributes new evidence on gender differences in technology adoption and productivity by providing nuanced analysis of differences between men and women farmers not only identifying the difference in productivity and technology adoption but identifying reasons why. The household headship and decision making in plots, and distinguishes between heads of the household. In addition, other social and demographic factors are used to further create a typology of women and men farmers and how these groups behave and respond differently in terms of input and service access, technology adoption, and productivity measures.

The Ethiopian case is also interesting and relevant since its government has been actively investing in its agricultural extension system in the past years. Ethiopia's extension system has one of the strongest extension agent farmer ratios found in the world. Over the years,

it had trained about 60,000 development agents for extension service provision (with only 15,000 agents prior to 2000). The field level extension service has now a strong foundation of 8,500 farmer training centers, built at the kebele (the lowest administrative division), staffed with 46,000 trained development agents (Davis et al. 2010).

While various studies have highlighted major institutional challenges remaining despite the extension reforms (EEA/EEPRI 2006; World Bank 2006; Byerlee et al. 2007; Davis et al. 2010; Spielman et al. 2010), the gender implications of these investments and challenges in extension system have not been addressed in the literature.

The Role of Agricultural Extension Service for Rural Women

It is believed that extension can increase agricultural productivity and rural income by bridging the gap between new technological knowledge and farmers own practice. In addition, effective extension systems elicit information about farmer's needs. According to (Berehanu et al., 2006), the extension service is generally biased towards crop production; the household package program appears to give better attention to the livestock sector. For example, dairy production, fattening of small ruminants and cattle, poultry and apiculture are important components of some of the household technology packages. With respect to effectiveness of the national extension services, extension methodology is not considered as something that has to be based on

professional scientific principles of information communication and technology knowledge and skill development. And also, little recognition and appreciation is given for the role of agricultural extension discipline as a separate area of expertise (Berhanu et al., 2006).

Factors Affecting Access and Utilization of Agricultural Extension Service

Socio-Cultural Norms and Family Responsibilities

Socially accepted norms of behavior and the roles women play in their families can have profound effects on the type of economic activities in which women can engage, the technologies available to them, the people and agencies with whom they can interact, the places they can visit, the time they have available and the control they can exert over their own capital.

In settings where socio-cultural norms restrict women's mobility, their interactions with members of the opposite sex and their ability to attend trainings or receive formal education,

women's access to information, institutions and markets is compromised. This is the case when women are not allowed to use public transportation, when they cannot afford to pay for it or when they cannot get away from their household responsibilities (Primo, 2003).

The gender division of labour in agriculture (sex-disaggregated activities across the lifecycle of a plant or animal, separate "male" and "female" crops and animals) "means" that female and male farmers usually have different extension needs. However, extension services worldwide remain dominated by men. Women are typically responsible for cooking, childcare, laundry, cleaning and the collection of water and fuel wood (Fletschner, 2008a and Bezner Kerr, 2008). While the gendered division of labour within agricultural production varies locally, men are typically in charge of tilling, ploughing, fumigating and selling crops to wholesale traders, and women tend to do most of the animal husbandry and the processing of agricultural or animal products (Fletschner, 2008a and World Bank, 2008b).

Similarly a study conducted by (Budlender, 2010) also indicted that household division of labor highlights women's double or triple burden of responsibility for productive, household, and community activities and a disproportionate amount of time spent on certain types of activities by women. Women in India spend 354 minutes a day, compared with 36 minutes by men, on household activities including cooking and caring for children.

In Tanzania, women spend 270 minutes per day, compared with men's 54 minutes, on similar tasks which are highly limits their access and control over agricultural extinction services. The (World Bank, 2009) report also supports that Women are usually required to care for the sick or orphans, thereby reducing the time they spend on farming and other productive activities. More importantly, women can lose their land after the death of the household head

Gender discrimination hampers women's participation in the governance of natural resources. Climate change, drought and natural resource degradation contribute to further exacerbate inequalities in access to and control over resources (World Bank, 2009). Rapidly increasing deforestation is making it more difficult for women to find firewood and to gain income from non-timber forest products (World Bank, 2009). This can have a disrupting effect on the livelihoods of landless women, such as widows and single women, who depend primarily on the use of forest and other common pool resources for their survival.

Inadequate Focus on Women's Needs and Roles during Technology Transfer

Agricultural technology transfer and capacity development is one of the main instruments to increase agricultural production and productivity. Very often women are not targeted by projects because it is assumed that the men of the families will transfer skills and knowledge to them (FAO, 2009). Moreover, technology research and innovations are rarely focused on women's specific needs and roles. For instance, little is invested in technology research into on-farm crop processing, which is largely undertaken by women farmers. As a result, rural women generally lack access to improved technologies for use in farming and processing, and the large majority of them still rely on traditional, labour-intensive and time-consuming technologies. Daily reproductive activities such as the collection of water and fuel wood, reduce the time spent by women on farming and other income generating activities. Women's time poverty and lack of access to improved technologies and techniques lead to low agricultural yields and low levels of food security (Carr, 2009).

In addition to the above findings, technology packages delivered by extension services sometimes reinforce stereotypic divisions of labor.

Ethiopia's Women's Development and Change extension package provides advice related to home gardens and poultry on the basis of the assumption that women do not farm but garden (Cohen and Lemma, 2011). In Nicaragua, Fonde Agro focused its efforts on women's patio gardens and failed to build on their important roles in the production and processing of coffee and in dairy, even though this was envisaged in the design stage (Farnworth, 2010).

Although information and communication technologies are a major contributor to extending the reach of extension services into remote locations where the networks exist and to diverse populations to reach women effectively, they need to account for women's lack of financial resources to pay for ICTs, higher levels of technology and language illiteracy, norms that discourage women from using technology, and lack of control over or ownership of technologies (Manfre, 2011).

Lack of Integrity by Development Agents

Farmer selection bias may be attributed with the sake of attaining maximum achievement to fulfill the assigned quota plan, and also they may focus to select and work with few

farmers whom they are resource-rich than poor and women farmers (Edlu, 2006). It is estimated that globally only 15 % of extension agents are women (World Bank, 2009).

Male extension agents frequently target male-dominated farmers groups and focus information and inputs on their needs (World Bank, 2009), sometimes because it may not be culturally acceptable for them to interact with women. When women do participate in extension activities, they may not be provided equal recognition for their responsibilities and skills. This is because farmers and farming activities continue to be perceived as "male" by policy makers, planners and agricultural service deliverers, thereby ignoring the important and increasing role women play in agriculture.

Inadequate Access to Credit

Financial institutions are among the main supporters of value chain actors. It is widely documented that women in developing countries, particularly women headed households and single women, have little access to credit and loans, often because of lack of collateral requirements, high transaction costs, limited education and mobility and the assumption that they will be unable to meet financial obligations in the absence of a male partner (Fletschner and Kenney, 2011 and Henriksen et al., 2010).

The provision of credit has increasingly been regarded as an important tool for raising the incomes of rural populations, mainly by mobilizing resources for more productive uses. As development takes place, one question that arises is the extent to which credit can be offered to the rural poor to facilitate their taking advantage of the developing entrepreneurial activities. Women access to credit is low. It may not be limited from the supply side alone. In fact, women may face demand-side constraints that make them less likely than their husbands to apply for loans, even when they have profitable projects and funds are available to them. For instance, demand-side constraints can arise when long travel distances and inconvenient schedules become greater obstacles for women due to their reproductive roles in the household, thereby increasing their transaction costs of applying for and repaying loans or when applying for a loan contravenes what is considered socially acceptable behavior for women (Fletschner & Carter, 2008). If these demand-side constraints are sufficiently strong, they can hamper women's effective demand for capital, leading to the almost perverse result where they are classified as having adequate access to capital when in fact they do not have access to funds.

Evidence from Bangladesh shows mixed results on the impact of credit access contributing to changing social norms and gender equality. Some studies show that women's bargaining position within households is strengthened by access to credit and the control over income and assets it brings. Other researchers, however, argue that the loans and the pressure to repay lead to stress, and to higher levels of domestic violence. Another study in Tanzania shows that while men seemed willing to acquiesce in women's new cash earning opportunities, they were much less willing to accept a restructuring of household relations. Complains over women arose from husbands who resent their wives' efforts to realize extra cash from trade and beer-brewing and even beating was cited as an increasing problem for women (UNSRID, 2005).

Inadequate Access to Land

Historically, extension services were designed for farmers with access to or ownership over land (Meinzen-Dick et al., 2010). This poses a challenge for women, whose access to land is shaped by a complicated web of social, legal, and customary norms. Globally, women's land ownership lags behind men's.

In sub-Saharan Africa, women make up roughly 15 percent of agricultural land holders, but huge differences exist by country: in Mali, less than 5 percent of agricultural land holders are women; in Botswana, Cape Verde and Malawi, they make up over 30 percent (FAO, 2011). In contrast to Latin America, where the share of women agricultural land holders is close to 20 percent, in southern Asia and southeastern Asia the proportion is closer to 10 percent (FAO, 2011). Gender inequalities in land ownership reduce women's access to extension services where land serves as a key criterion for establishing who extension clients are. When women do own land, their plots are small, often of poor quality, requiring extension advice tailored to the agronomic potential of their land holdings. Land ownership often facilitates eligibility for access to other productive resources, such as credit or producer associations, which allow men and women farmers to act on the information they receive.

Similarly, in Ghana, research by Goldstein and Udry (2005) research found that productivity differentials between men and women farmers are the result of women's higher level of tenure insecurity. Women will avoid investing in fallowing their land and will continuously farm it or risk losing access to the land from one season to the next.

As producers, women have weak property and contractual rights to land, water and other resources (Quisumbing and Pandolfelli, 2009, and FAO, 2013). Paradoxically, and in spite of control and management of property being a crucial requirement to productivity, because many countries do not collect separate data on women's and men's ownership or access to land, water or credit. Secure land tenure is central to accessing water, soil fertilizers and improved seeds as well as accessing credit, loans and extension services (Lee-Smith and Trujillo, 2006 and Daley andPark, 2011).

In Ethiopia only 18.7% of the landholders were women and the rest of the rural women, it is their husband, fathers and brothers who hold land title, a practice which essentially eliminates their eligibility for formal sources of credit or membership in farmer organization which could enable them to gain access to input that can help stabilize or enhance their production system (MoARD, 2009).

Inadequate Focus for Female Headed Household in Extension Services

Swanson & Rajalahti(2010) stated that strengthening women's leadership skills is essential to enable women to participate in decentralized governance institutions and articulate their extension needs. In many countries agricultural extension systems are increasingly decentralizing programme planning and management functions to the district and sub-district levels, as a way to create a more participatory, demand-driven extension system. The participation of different categories of farmer ensures that their specific needs are reflected in the definition of the extension programme. There is increasing recognition that farming is a family business, in many societies the head of household, whether a man or a woman, is still defined as the primary farmer and is perceived as the only appropriate recipient of agricultural extension information.

In contrast to the findings of the above study, this is slowly changing, according to a report by the World Bank (2010), many institutions continue to operate under the perception that "women are not farmers" (World Bank, 2010). As a result, women are underserved as clients of extension services in their own right, often seen to be only helping. Alternatively, they are targeted for agricultural information related to home economics.

Similarly, the World Bank report extension services are decisive to furthering knowledge, skills, information and technology adoption along value chains. Many studies show that extension systems do not yet pay adequate attention to gender and that extension services

are lower for women as compared to men (Ragasa, et al., 2012 and Quisumbing and Pandolfelli, 2009). For example, a study carried out in Ethiopia (Ragasa, et al., 2012) concludes that female farmers are less likely to get extension services and less likely to access quality service than their male counterparts. Among female heads, those with more male members in their household and more assets in the form of land and livestock are more likely to be visited or to initiate visits to extension service providers.

More importantly, the study concludes that, holding other factors constant, plots of male and female farmers are as equally productive. It is not gender by itself that explains productivity, but the differentiated access to quality extension, radio connectivity and inputs as well as the quality of plots and agro ecological conditions.

Women fare poorly when services are delivered through group or community meetings held by extension agents: in Ghana, 0 to 6 percent of women-headed households and 5 to 9 percent of women spouses versus 11 to 24 percent of men-headed households participate in meetings, and in Ethiopia, 11 percent versus 28 percent of women and men, respectively (World Bank, 2010). Women may also be excluded from membership-based groups such as producer associations or dairy cooperatives. In Ethiopia, 24 percent of men and 4 percent of women belonged to some kind of cooperative, and 13 percent of men and 2 percent of women belonged to agricultural cooperatives (World Bank, 2010). Gender differences also exist in Ghana: 2 to 5 percent of female spouses and only 3 to 7 percent of female-headed households belonged to a community based organizations (World Bank, 2010). Women are also excluded from rising to leadership positions in these organizations as a result of biases about their skills. In Ethiopia, men are five times more likely than women to hold a leadership position within a cooperative; in India, only 10 percent of dairy cooperatives had women chairpersons (World Bank, 2010).

Method Used

For the review paper, the researcher used secondary sources of data by reviewing the findings of different researchers work on factors affecting access and utilization of agricultural extension service.

Conclusion

Female farmers are less likely to get extension services and less likely to access quality service than their male counterparts. Although extension service can increase agricultural

productivity and rural income by bridging the gap between new technological knowledge and farmers own practice, effective extension systems elicit information about farmer's needs, technology research and innovations are rarely focused on women's specific needs and roles. Very often women are not targeted by projects because it is assumed that the men of the families will transfer skills and knowledge to them.

It was found that rural women generally lack access to improved technologies for use in farming and processing, and the large majority of them still rely on traditional, labour-intensive and time-consuming technologies. Daily reproductive activities such as the collection of water and fuel wood, reduce the time spent by women on farming and other income generating activities.

It revealed that technologies do not account for women's need, lack of financial resources to pay for it, higher levels of technology and language illiteracy, norms that discourage women from using technology, and lack of control over or ownership of technologies.

References

Berhanu Gebremedhin, Hoekstra D and Azage Tegegne. 2006. Commercialization of Ethiopian agriculture: Extension service from input supplier to knowledge broker. IPMS,2006.

Budlender, D. 2010. Time Use Studies and Unpaid Care Work. UN Research Institute for Social Development. New York: Routledge.

Carr, M., et al., 2010. Lightning the load, Rome: IFAD and Practical Action Publishing Ltd.

Cohen, M., and M. Lemma. 2011. Agricultural Extension Services and Gender Equality: An Institutional Analysis of Four Districts in Ethiopia. IFPRI Discussion Paper 010904. Washington, D.C.: International Food Policy Research Institute.

Davis, K., B. Swanson, D. Amudavi, D. Ayalew Mekonnen, A. Flohrs, J. Riese, C. Lamb, and E. Zerfu. 2010. In-Depth Assessment of the Public Agricultural Extension System of Ethiopia and Recommendations for Improvement. IFPRI Discussion Paper 01041. Washington, DC: International Food Policy Research Institute.

Edlu Badwo, 2006. Extension Program Coverage and Utilization by Different Categories of Farmers in Enemore and Ener Woreda, Gurage Zone. M.Sc. Thesis, Presented to the School of Graduate Studies of Haramaya University.

EEA/EEPRI (Ethiopian Economic Association/Ethiopian Economic Policy Research Institute). 2006. "Evaluation of the Ethiopian Agricultural Extension with Particular Emphasis on the

Participatory Demonstration and Training Exten-sion System (PADETES)." Addis Ababa, Ethiopia: EEA/EEPRI.

Farnworth, C.R. 2010. Gender Aware Approaches in Agricultural Programmes: A study of Sida-supported Agricultural Programmes. Sida Evaluation 2010: 3.

Fletschner, D. 2008a. Rural women's access to capital: Intrahousehold bargaining and social effects., Saarbrucken, Germany, VDM Publishing House.

Fletschner, D., & Carter, M. (2008). Constructing and reconstructing gender: Reference group effects and women's demand for entrepreneurial capital. Journal of Socio-Economics, 37(2), 672-693.

Fletschner, D. and Kenney, L. (2011). Rural women's access to financial services: credit, savings and insurance. ESA Working Paper No. 11-07, Agriculture Development Economics Division, Rome: FAO.

Food and Agriculture Organization. 2011. The State of Food and Agriculture 2010-2011. Rome: Food and Agriculture Organization of the United Nations.

Goldstein, M., and C. Udry. 2005. The profits of power: Land rights and agricultural investment in Ghana. Center Discussion Paper No. 929. New Haven, Conn., U.S.A.: Yale University.

Lee-Smith, D. And Hinchey, C. (2006). "Unequal Rights: Women and Property." In: Jane S. Jaquette and Gale Summerfield (eds.). Women and Gender Equity in Development Theory and Practice. Institutions, Resources, and Mobilization. Durham and London. Duke University Press. 159 - 172.

Manfre, C. 2011. Extending the Benefits: Gender-equitable, ICT-enabled Agricultural Development. In ICT in Agriculture: Connecting Smallholders to Knowledge, Networks, and Institutions E-sourcebook. Washington, D.C.: The World Bank. Available at www.ictinagriculture.org/ictinag/content/ict-agriculture-sourcebook.

Meinzen-Dick, R., A. Quisumbing, J. Behrman, P. Biermayr-Jenzano, V. Wilde, M. Noordeloos, C. Ragasa, and N. Beintema. 2010. Engendering Agricultural Research. IFPRI Discussion Paper 00973. Washington, D.C.: International Food Policy Research Institute.

MoARD(Ministry of Agriculture and Rural Development), 2009, Training Material on Gender Concepts, Kombolcha.

Mogues, T., M. Cohen, R. Birner, M. Lemma, J. Randriamamonjy, F. Tadesse, and Z. Paulos. 2009. Agricultural Exten-sion in Ethiopia through a Gender and Governance Lens. ESSP II Discussion Paper 7. Addis Ababa, Ethiopia: Ethi-opia Strategy Support Program II, International Food Policy Research Institute.

MoWA(Ministry of Women's Affairs) and ADB(African Development Bank), 2009, Training Manual on Gender Mainstreaming and Reporting, Momentum Consultancy.

Primo, N. 2003. Gender issues in the information society. Paper prepared for the World Summit on the Information Society, Paris, France, UNESCO.

Quisumbing, A. and Pandolfelli, L. (2009). Promising approaches to address the needs of poor female farmers: Resources, constraints and interventions. International Food Policy Research Institute (IFPRI). Discussion Paper 00882. Washington: IFPRI.

Ragasa,C., Berhane, G., Tadesse,F., and Taffesse, S. (2012). Gender differences in access to extension services and agricultural productivity. ESSP Working Paper 49. Ethiopia Strategic Support Program II, Ethiopian Development Research Institute (EDRI) and International food Policy Research Institute (IFPRI).

Swanson B., Rajalahti R., 2010. Strengthening Agricultural Extension and Advisory Systems: Procedures for Assessing, Transforming, and Evaluating Extension Systems. Washington DC: The International Bank for Reconstruction and Development/The World Bank.

UNSRID - United Nations Research Institute for Social Development. (2005). Gender Equality. Striving for Justice in an Unequal World. UNSRID.

World Bank. 2009. Gender in Agriculture Sourcebook. Washington, D.C.: World Bank.

Indigenous Technical Knowledge of Tribal Farmers about Pest Management in Crop Production

P.L.Manohari[1] and Ratan R.P.S[2]

Abstract

The paper presents data on a study conducted in four villages of two blocks of tribal dominated Dumkadistrict of Jharkhand, India. The study having objectives of documenting and appraising the indigenous technical knowledge (ITK) about pest management in crop production used the interview schedule, observation and informal group discussion methods. Two categories of respondentsi.e100 Farmers and 30 Scientists constituted thesample size. Findings indicated that altogether eight ITKs were found to be practiced by the farmers. All eight ITKs were reported to be having scientific rationale with explanations given by the scientist respondents. Four ITKs out of eight were put before the respondents for studying their perception on selected four attributes i.e productivity, stability, sustainability and equitability. All four ITKS were perceived to be effective and useful by both the categories of respondents.

Keywords: Indigenous People, Tribal People, Tribal Farmers, Indegenous Technical Knowledge, Pest Management, Crop Production, Jharkhand, India.

Introduction

Farmers especially the resource poor Farmers are engaged continuously in experimenting, adapting and innovating new knowledge. They are profession specialists' in survival, but their skill and knowledge have not yet been recognised. Indigenous technical knowledge (ITK) based management practices are adopted by farmers to avoid or minimize adverse effects arising from vagaries of weather or from incidence of pests and diseases in crops and livestock production. The farmers knowledge, inventions and experimentation have long been undervalued and therefore, farmers and scientists should be partners in the real

[1] Assistant Director, (Agricultural Extention) MANAGE, Hyderabad. Corresponding Author Email : plmanohari@manage.gov.in

[2] Director of Extention (Retd.) Birs Agricultural University (BAU) Ranchi.

Received Date: 25-06-2020 Accepted Date: 10-02-2021

and full sense of that work in the research and extension processes. Keeping this in view, a study was conducted to document and appraise the ITK's about pest management in crop production with the objectives of exploring scientific rationale and perceptions of farmers and scientists on the selected ITK's.

Methodology

The study was conducted in purposively selected Dumka district of Jharkand, where the tribal population is dominant and traditional agricultural practices are prominent in comparison to other districts of the state. Data were collected from four randomly selected villages (two agriculturally progressive and two less progressive) ofJarmundi and Jama blocks of the district in the year 2019. The sample consisted of randomly selected 100 farmer respondents. Apart from farmer respondents, 30 scientists from different disciplines of headquartersof Brisa Agricultural University, Ranchi and Zonal Agricultural Research Station, Dumka were selected randomly, who constituted the second category of respondents. Scientist respondents were selected for seeking their perception on selected attributes of the ITKs. The scientist respondents were also asked for scientific rationality.

A combination of data collection tools viz., interview schedule, audio-visual recording and organization of village level workshop were employed. Data were collected through personal interview, observation and in-depth informal discussion with the farmer respondents. The perception of farmer respondents. The perception of farmer respondents on selected attributes of selected ITKs were measured with the help of a well-structured and pretested schedule developed for this purpose. The responses were obtained between 5 and point rating scale for the selected practices on four attributes namely, productivity, stability, sustainability and equitability. The points on the rating scale were "strongly agree", agree, undecided, disagree and strongly disagree by giving scores of 5,4,3,2, and 1, respectively. The weighted mean scores of the individual practices were then calculated. The practices which were assigned mean scores above 3.5, between 2.5 to 3.5, and below 2.5 were considered to be high, medium and low respectively for their corresponding attributes. Altogether there were eight statements in the scale with maximum obtainable score of 40 statements and minimum obtainable score of 8.

Findings and Discussion

Profile of farmer respondents

Majority of the farmer respondents were young in age(42%) belonging to scheduled tribes community (65%) having education from primary to middle school level (76%) with marginal and small size of holdings (76%) and agriculture as their main occupation (87%) and belonging to medium socio-economic status (87%).

Profile of Scientist respondents

Majority of the scientist respondents were men (94.59 %), middle aged (70.27 %), having designations of Associate Professor/ Senior Scientists/Programme Coordinator (56.75 %) involved in research and extension (94.59 %) with experience of 10-15 years in ITK-related work (56.75 %).

Indigenous Technical Knowledge for Pest Management

An attempt was made in this section to identify and document indigenous technical knowledge about pest management along with their farming situations and scientific rationale.

Table:1 Frequency Distribution of Respondents by their use of Indigenous Technical Knowledge about Pest Management along with the Farming Situations and their Scientific Rationale

Sl. No	Indigenous technical Knowledge	ITK followed by respondents			Farming Situation	Scientific Rationale
		Agriculturally Progressive Villages (n=50)	Agriculturally Less Progressive Villages (n=50)	Pooled (n=100)		
1.	Paddy Case worm (Nymphula depunctalis) is controlled by cow dung ash mixed with water to form a concentrate solution in which kerosene oil @1.5 litre per 10 litre solution) is mixed and then sprayed on the crop with the help of a broom	9(18.0)	17(34.0)	26(26.0)	Medium and low land rice fields having water during tillering stage	Kerosene Oil is a petro-chemical, which is toxic for the insects, it acts on respiratory organs causing suffocation and cow dung ash acts as abrasive causing physical injury to the insects.

Sl. No	Indigenous technical Knowledge	ITK followed by respondents			Farming Situation	Scientific Rationale
		Agriculturally Progressive Villages (n=50)	Agriculturally Less Progressive Villages (n=50)	Pooled (n=100)		
2.	Sinduar (Vitexnegundo) leaves are boiled in water (@1 kg leaves per 5 litre of water for 0.6 acre) and the cool decoction is sprayed on the plants with help of a broom to control paddy case worm (Nymphulade punctalis)	6 (12.0)	14 (28.0)	20 (20.0)	Medium and low land rice fields having water during tillering stage	The chemical extracted from sinduar leaves act as intoxicant on the insect.
3.	In Solanaceous vegetables (tomato, brinjal and chillies) tobacco leaf soaked water @ 150g tobacco leaf in eight litres of water) is sprayed in fields with the help of a broom to check stem borer (Helicover paarmigera)	10.(20.0)	40(80.0)	50(50.0)	Up, Medium & low land under rainfed situation.	Tobacco contains an alkaliod i.e nicotine which possesses insecticidal property.

Sl. No	Indigenous technical Knowledge	ITK followed by respondents			Farming Situation	Scientific Rationale
		Agriculturally Progressive Villages (n=50)	Agriculturally Less Progressive Villages (n=50)	Pooled (n=100)		
4.	Cow dung ash is broadcast and crop is irrigated to prevent potatoes from frost	13(26.0)	21(42.0)	34(34.0)	Up & Medium land potato field	Cow dung ash is used to absorb moisture and irrigation helps to maintain optimum temperature, which reduces the chance of frost attack
5.	Paddy caseworm (Nymphulade punctalis) is controlled by cow or buffalo urine through its spray in the field with the help of a broom	3(6.0)	4(8.0)	7(7.0)	Medium and low land rice fields during tillering stage.	Urine contains uric acid which had toxic effect on insects.
6.	During panicle initiation stage in rice cropgundhi bug is controlled by lightening up fire along the bunds	7(14.0)	9(18.0)	(16.0)	Medium and low land rice fields during tillering stage.	This is a physical means to control the insects. The insects get attracted towards light which are burnt and died.

Sl. No	Indigenous technical Knowledge	ITK followed by respondents			Farming Situation	Scientific Rationale
		Agriculturally Progressive Villages (n=50)	Agriculturally Less Progressive Villages (n=50)	Pooled (n=100)		
7.	During initiation stage in rice crop bug is controlled by moving straw of jute rope dipped in kerosene oil by two persons holding each end of the rope at both sides of the fiels,	6 (12.0)	11(22.0)	17(17.0)	Medium and low land rice fields during tillering stage.	This is a Mechanical control to check the insect pest. Rope is used to physically dislodge the insects from the plants and kerosene oil acts as poison on insects.
8.	Maize crop is protected from insect pests by growing sun hemp along the field from the four sides	4(8.0)	6(12.0)	10(10.0)	Up and Mediuml and under rainfed situation.	Sun hemp acts as a trap crop. This is a biological method to control insect pest. Sun hemp acts as an alternate host and protects the main crop from infestation.

Figures in parentheses indicate percentages

Altogether 8 number of indigenous technical knowledges (ITKs) were reported to be practiced by the farmers. The data presented in Table 1 revealsthat control measure listed at Sl.no 1 was used for protecting rice crop from paddy caseworm (Nymphuladepunctalise) as reported by 25 percent of the respondents. In this practice,cow dung ash is mixed with water to form a concentrate solution in which kerosine oil @ 1.5 litre/10 litre solution is mixed and then sprayed on rice crop with the help of a broom which protects the plants from caseworm.

The associated rationale is that kerosene oil is a petro chemical which is toxic for the insects. It acts on respiratory organs causing suffocation and cow dung ash acts as abrasive causing injury to the insects.

Another method for controlling paddy caseworm was spraying of cool decoction of Sinduar (Vitexnegundo) prepared with boiled water @ 1kg leaves per 5 litres of water for 0.6 acer as adopted by 20% of the respondents. The chemical extracted from sinduar leaves acts as intoxicant on the insect.

The findings further reveal another measure used for protecting the vegetable crops (tomato, brinjal and chillies) from stem borer (Helicoverpaarmigera) as reported by 50 percent of the respondents. In this practice farmers use to spray tobacco leaf soaked water @ 150g tobacco leaves in 8 liters of water in field with the help of abroom to cheek stem borer tobacco contains nicotine which possesses insecticidal property.

Another important control measure was found to be used to prevent potato frost as reported by 34 percent of the respondents. In this practice cow dung ash is broadcast in the field and crop is irrigated. Cow dung ash is used to absorb moisture and irrigation helps to maintain optimum temperature, which reduces the chance of frost attack.

It was also revealed that for controlling caseworm in paddy cowor buffalo urine is sprayed in standing rice fields with the help of a broom. Urine contains uric acid which has toxic effect on insects. However, this practise was found to be used by a very low percentage of the respondents (7%).

Gundhi bug (Leptocorisaacuta) is one of the major pest problem in rice. For controllinggundhibug, farmers(16%) use to burn discarded rubber tyre holding in their hands and moving along the field. Gundhi bugs are attracted towards the burning tyres and get burnt. For controlling gundhibug another measure was also used by the farmers (17%). In this practice farmers through a straw or jute made rope dipped in kerosene oil use to physically dislodge the insects. Two persons are required tohold the rope at both the end at both sides of the field and move simultaneously. Kerosene oil in this process acts as poison for insects.The findings further revealed that for controlling insect pest in maize crop from pests, sunhempis intercropped/mixed cropped with maize or grown along with the boundaries of the maize field. Sunhempacts as a trap crop or alternate host. This is a biological method to control the insect pests.

The analysis for the use of indigenous practices for controlling insect pests revealed that the farmers were using such methods, which were low cost and compatible to components of their farming systems and household internal resources.

Farmers and Scientists Perception of ITK about Pest Management

An attempt was made in this section to explore farmers and scientists perception of the ITK about insect pest management. In the present study perception refers to the mental perceptional evaluation by a respondent about designed attributes of the selected indigenous agricultural technologies. For this analysis only four ITKs were selected which were being practiced by more than 20 percent of the farmers.

The weighted mean scores assigned by the farmers and scientist respondents with respect to the four attributes of selected indigenous technical knowledge about pest management have been presented in Table 2.

Table 2: Farmers and Scientist Perception of Selected ITK's about pest management on their selected Attributes.

Sl. No	Indigenous Technical Knowledge	Perceptionscores on the Selected attributes							
		Productivity		Stability		Sustainability		Equitability	
		Farmer	Scientist	Farmer	Scientist	Farmer	Scientist	Farmer	Scientist
1.	Paddy caseworm (Nymphuladepunctalis) is controlled by cow dung ash mixed with water to form a concentrate solution in which kerosene oil (@ 1.5 litre / 10 litre Solution) is mixed and then sprayed on crop with the help of a broom	3.32	3.61	3.44	3.52	3.71	3.44	3.33	1.42

Sl. No	Indigenous Technical Knowledge	Perceptionscores on the Selected attributes							
		Productivity		Stability		Sustainability		Equitability	
		Farmer	Scientist	Farmer	Scientist	Farmer	Scientist	Farmer	Scientist
2.	Sinduar (Vitexnegundo) leaves are boiled in water (@ 1 kg leaves per 5 litre of water for 0.6 acer) and the cool decoction is sprayed on the crop with the help of a broom to control rice case worm (Nymphulade punctalis)	3.52	1.51	3.54	1.62	3.40	1.71	3.34	3.44
3.	In Solanaceous vegetables (tomato, brinjal and chilli) tobacco leaf soaked water @ 1.50 g tobacco leaves in eight litres of water) is sprayed in field with the help of a broom to check stem borer (Helicoverpaarmigera)	3.63	1.42	3.42	1.44	3.90	1.42	3.33	3.11
4.	Cow dung ash is broadcast and crop Is irrigated to prevent potatoes' from frost	3.62	4.61	3.44	3.30	3.30	3.60	3.34	4.62

Note: Above 3.5 : high; 3.5-2.5 : medium and < 2.5 : low perception

Table 2 shows that ITK listed at Sl.no 4 i.e "application of cow dung ash to protect potato from frost" was rated to be high in productivity by both the categories of respondents wt.mean score above 3.5 and ITK listed Sl.no 2 and 3 i.e "spraying of decoction of

sinduar leaves for controlling paddy caseworm and spraying of tobacco leaf soaked water in solanaceous vegetables to check stem borer" were rated as highly productive by the farmer respondents, where as the two practices were rated as less productive by the scientist respondents. (wt. mean scores below 2.5). But in respect of ITK at Sl.no 1 i.e spraying of cow dung ash and kerosene oil for checking caseworm in paddy", scientists perceived it as highly productive and farmers perceived it of medium productivity.

On stability criteria there were wide variations between perceptions of both the categories of respondents. ITK listed in sl.no 2 was rated by the farmers as of higher stability and ITKs listed as Sl.no 1 was rated by the scientists as of higher stability. Rest of the ITK's mentioned in the table were rated as of medium stability by the farmers and scientists rated two of them (Sl.no 2and 3) as of low stability.

Similarly with respect to sustainability ITK's listed at Sl.no 1 and 3 were rated by the farmers as highly sustainable and only one ITK (Sl.No 4) was rated to be of medium sustainability by the scientists.

In case of equitability only one technology (Sl.no.4) was rated to be highly equitable by the scientist respondents (wt.mean score above 3.5) and technology listed at Sl.No 2 and 3 were rated to be of medium equitability by both the categories of respondents. ITK mentioned at Sl.No 1 was rated less equitable by the scientists as they perceived that kerosene oil, an important ingredient of the ITK was not easily available to resource poor farmers, even for lighting their lamps whereas, it was perceived as of medium equitability by the farmer respondents themselves.

Conclusion

Altogether eight number of ITKs were found to be practiced by about 20-50 per cent of the farmers. Out of eight ITKs, four were selected for eliciting farmer's and Scientist's perception for selected attributes viz; productivity, stability, sustainability and equitability. Application of cow dung ash to protect potato from frost was rated to be highly productive by both the categories of respondents (weighted mean score > 3.5). On stability criteria there were wide variations between perceptions of both the categories of respondents.

Similarly with respect to sustainability of ITKs the two ITKs , namely tobacco soaked water for controlling stem borer in solanaceous vegetables and another as referred above were rated high sustainable by the farmer respondents. In case of equitability criteria, only one technology i.e "Cow dung ash is broad cast in potato crop followed by irrigation prevent frost" was rated to be highly equitable weighted mean score (>3.5) by both the categories of respondents. This implies that the Agriculture research system is required to test and validate the referred ITKs in order to explore their efficacy and potentiality. This will be helpful to the Scientists in generation of low-cost, need-based, location-specific and eco-friendly appropriate technologies to make them more readily acceptable to the farmers.

References:

Quarterly Report on Participatory Adaptive Research Project, Rampachodavaram implemented by MANAGE , 2001-02

Technology demonstrations, Enhancing resilience and adaptive capacity of farmers to climate variability, published by CRIDA during 2016

Evaluation of Participatory Adaptive Research Project, Book published by MANAGE

Extension alternatives in Tropical Africa, John Moris,1991, Overseas Development Institute

Statement of Ownership and other Particulars of
Journal of Agricultural Extension Management

Place of Publication	: Hyderabad
Periodicity of Publication	: Half - yearly
Publisher's Name	: Dr. P. Chandra Shekara Director General, MANAGE
Nationality	: Indian
Address	: MANAGE, Rajendranagar, Hyderabad - 500 030
Editor's Name	: Dr. Saravanan Raj Director (Agricultural Extension), MANAGE
Address	: MANAGE, Rajendranagar, Hyderabad - 500 030
Printed at	: Vaishnavi Laser Graphics Hyderabad - 500 027. Ph: 040 - 27552178

National Institute of Agricultural Extension Management

(An Organisation of Ministry of Agriculture and Farmers Welfare, Govt. of India)
Rajendranagar, Hyderabad - 500 030, Telangana, India
Tel: +91-40-24016702-706, Fax: +91-40-24015388 Website: www.manage.gov.in