ASSESSMENT OF DIVERSIFIED LIVELIHOOD OPTION IN RAIN FED COMMUNITIES IN AGUSAN DEL SUR

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Abstract

This paper presented the assessment of diversified livelihood option in rain fed communities in terms of socio-economic profile, farm diversification, livelihood options, farmer's income, farm problems, and identify factors which influence livelihood option. Results revealed rain fed areas practiced conventional farming system, crops ranging from 2-7 and needs to be integrated and diversified on farming system approach. Livelihood option is necessary considering the financial status, geographic condition, and physical environment to augment their family income. Next generation of farmers shall have relevant technical knowledge, abilities, competencies, and develop entrepreneurial skills in order to produce high quality products that compete in the ASEAN and global market. Research and innovation shall be developed to facilitate viable and applicable technology to optimize scarce resources and attaining economic development and food security in the area. Climatic condition in the area needs to be assessed in order to ensure the timing of production activities leading to optimize and efficient use of resources. This research gathers data to related issues in the status of agricultural production to assess appropriate technologies in research development, agricultural policy and structural reforms. With the vast area of 5,155.76 hectare in Agusan del Sur as a potential resource can improve the agricultural production through application of technologies that are simple but viable in rain fed communities.

Keywords: rain fed, livelihood option, diversification, technologies, farm efficiency

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1.0 Introduction

Philippines constitute about 74% uplands and are predominantly a rain fed country. An estimated 20 million Filipinos are in these areas who may only plant rice as their staple food once a year instead of twice due to rain-dependence. Rain fed areas has been neglected despite its huge contribution of almost half of food production. If develop, maybe this can rise to 60 to 70 percent (Navarro, 2012). However, a problem such as soil erosion is widespread in these areas with devastating impact on farm household. Poverty, poor infrastructure, lack of institutions and policies, unemployment, and poor health and sanitation are entrenched among these communities (DA-BAR-ICRISAT Report, 2001). To address this problem, the government launched the Rain fed Agriculture Program through Community Based Watershed Management (CBWM) and other livelihood options suited for rain fed communities.

The National Rain fed Program through the Department of Agriculture (DA) is aimed at raising food production in more than one million hectares of land tended by the country's poorest farmers. DA has partnered with India-based International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) to carry out the Philippine Rain fed Agriculture Research and Development and Extension Program (PhiRARDEP). DA will work on PhilRARDEP through its staff bureaus, Bureau of Agricultural Research (BAR), together with its Regional Field Units (RFU) - Regional Integrated Agricultural Research Centers (RIARCS), Agricultural Training Institute Regional Training Centers (ATI-RTC) as well as selected State Universities and Colleges (SUCs). In order to succeed the program, a based line data for need

assessment is timely, hence this study is conducted. This paper presents the results of the assessment of diversified livelihood in crop farming systems in lowland and upland rain fed communities of Agusandel Sur, Caraga Region, Philippines.

In the ASEAN context, the programs and projects in rain fed projects shall be coherent in the strategic trust priorities and confront the major challenges in the priority areas of cooperation. Enhance quantity and quality of production with sustainable, 'green' technologies, resource management systems, and minimize pre- and post-harvest losses and waste; enhance trade facilitation, economic integration and market access; ensure food security, food safety, better nutrition and equitable distribution; increase resilience to climate change, natural disasters and other shocks; assist resource constrained small producers and SMEs to improve productivity, technology and product quality, to meet global market standards and increase competitiveness; strengthen ASEAN joint approaches on international and regional issues affecting the FAF sector (Minh, 2015).

The study would characterize the role of livelihood options and priority research areas to enhance their contributions to environmentally sustainable production systems for the improved welfare of rain fed lowlands and uplands communities in Agusan del Sur. Specifically the objectives are to identify related issues in the status of agricultural production to assess appropriate technologies in research development, agricultural policy review or amendment and structural reforms; determine the socio-economic profile; identfy the livelihood options; determine crop diversification level; determine the estimated income

in rain fed farming;determine the problems in rain fed communities; identify support government agencies (GA's), private sector institutions, non- government organization (NGO's), partner institutions and individuals working in this subject area. Moreover, addressing issues and concerns in rain fed communities like food security, poverty alleviation, societal conflicts, environmental protection, climate change, water management system, agricultural productivity, and sustainability shall be given emphasis through development programs. The study is limited on the assessment of the diversified livelihood options in rain fed farming communities in the municipalities and barangays with three hundred sixty two (362) respondents in Agusan Del Sur.

Research integration, technology generation, strengthening capability building, entrepreneurial skills development and possible amendment of agricultural policies can provide solutions to vulnerable people especially the poor that can eradicate poverty, malnutrition, and farm inefficiency leading to a better quality of life. Challenges on agricultural research can carry out not only bridging the gap of knowledge but to address related problems to environmental issues, post-harvest and marketing of products, climate resilient varieties, through innovation and technology that can provide win-win solutions between human, agriculture, and development.

2.0 Theoretical Framework and Success Stories in Agriculture

Rain fed agriculture is a globally important issue to address its potential vast area which constitute 10 million ha.in the Philippines and contributes 40% of the food production supply. Department of Agriculture in 2011 released 20 million initial funds for a National Rainfed

Agriculture program partner with International Crops Research Institute for Semi-Arid Tropics (ICRISAT). Figure 1 shows the theoritical framework of the study. Agricultural policy, structural reforms, resources, and research innovations are the necessary inputs in rain fed programs and projects. Setting strategic goals through partnership, capability building, and improving its comptencies are the activities in order to achieve immediate and long term effects that can help them to be resilient and empowered.

Wani et al., (2009) project entitled integrated water management in rain fed agriculture Food Agriculture Organization (FAO) in March 2011 presented its achievements and success stories in IPM developments and forest regeneration. Moreover, in Burkina Faso, West Africa, water harvesting with mulching, in Nigeria, inter-croping with drought resistance varieties, in Kenya, Agro-forestry with composting, and in Uganda, integrated livestock are the solutions to improve farm efficiency. (World Bank Institute). With these success stories and research innovations, rain fed agriculture in the Philippines had high hopes to improve farm productivity, food security, and increase income.

3.0 Research Methodology

Twenty six (26) barangays from eight (8) municipalities of Agusan del Sur, Caraga Region, Phiippines were identified as rain fed communities with a total area of 5,155.76 hectares and assessed in terms of appropriate technologies in research development, agricultural policy, structural reforms, socio-economic profile, farm diversification level, livelihood options, farmers income, and identification of rain fed farm problems. A cross-sectional survey research design and practical research were used in the study which involves
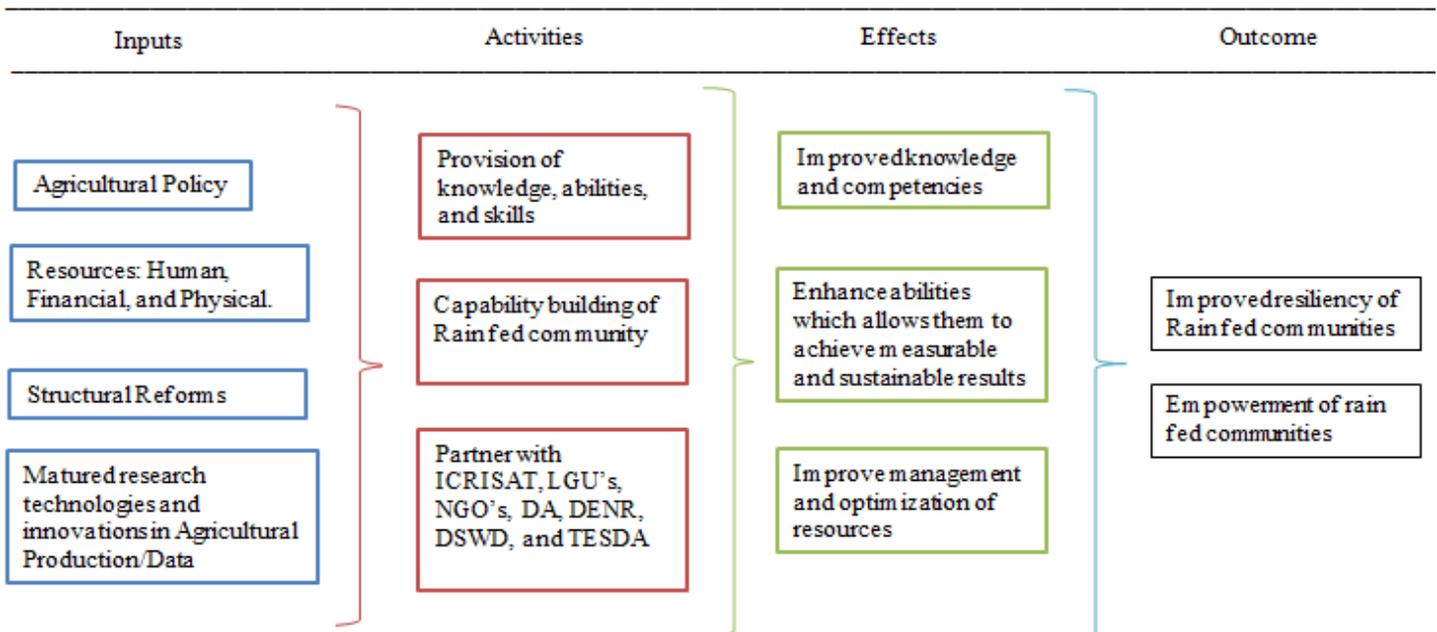

Figure 1. Theoritical framework of the study

first hand research in the form of questionaire, surveys, interviews, and observations. Inclusion criteria for this study are farmers in selected barangay's in Agusan del Sur belong in rain fed communities and considering factors like accesibility, transportation, and peace and order situation.

A multinomial logit model was used to identify factors which influence livelihood diversification of rain fed farmers. Multi nominal logit model was used. This is to determine the relative importance of different sources of livelihood. Slovin formula was used to determine the sample size of the study. Peace and order and accessibility of the area/place were also considered in the selection of sample size.

A total of three hundred sixty two (362) respondents were evaluated through the use of semi structured questionnaire, interviews, and personal immersion by the enumerators. All data were summarized, tabulated, and analysed through frequency counts, means, ranking, and percentage. Project duration is 1 (one) year and conducted from April 2013 to April 2014.

4.0 Results and Discussion
Socio Economic Profile

Table 1 shows the socio economic profile data which include farmer's educational background, age, farm size, gender, family size, and number of years in farming. It served as the picture, status in a given point in time, availability of resources, and problem identification in the area and can be integrated as basis for strategic planning and budgeting in the local government unit (municipality and barangays). Moreover, legislators can analysed this data, formulate or amend policy in rain fed agriculture area to boost up the economic activity in the given area and bring about significant change.

Another key to ensure the human resource of agricultural sector is to provide relevant programs, projects, and more assistance in agricultural education. It unlocks the ability to deliver competent skills training in production, management, research, and entrepreneurship. To ensure successful outcome of this programs, competency based education, research development program, and technology integration, and policy reforms should be considered.

On the other hand, age bracket revealed that farmers was in their middle age (41-60 years of age) which constitutes about 54.69% followed by the young age (40 years and below) with 30.12 %. Old farmers (61 and above) constitute only 15.19% of the respondents. This implies that farmers in rain fed communities requires a new generation of young farmers to continue to do farming to attain continuous food supply all year round. Thus, promotion in agriculture education through scholarship programs needs to be address.

Table 1. Socio economic profile of rain fed communities in Agusan del Sur

Profile	Frequency	Percentage
Sex		
Male	237	65.47
Female	125	34.53
Total	362	100.0
Age		
Young (40 yrs & below)	109	30.11
Middle-age (41-60 years)	198	54.69
Old (61 and above)	55	15.19
Total	362	100.0
Educational Qualification		
Elementary Level	97	26.80
Elementary Graduate	56	15.47
High School Level	72	19.89
High School Graduate	71	19.61
Vocational	6	1.66
College Level	30	8.29
College Graduate	30	8.29
Total	362	100.0
Family Size		
1-2	197	54.42
3-4	138	38.12
5-6	16	4.42
7-8	6	1.66
9-10	3	0.83
11-12	2	0.55
TOTAL	362	100.0
Farm Size		
<1 - 1 hectare	112	30.94
2-3 hectares	220	60.77
4-6 hectares	24	6.63
7 - >7 hectares	6	1.66
Total	362	100.0
Years in Farming		
<5 - 5 yrs	41	11.33
6-15 yrs	90	24.86
16-25 yrs	113	31.22
26-35 yrs	62	17.13
36-45 yrs	45	12.43
46->46 yrs	11	3.04
Total	362	100.00

Livelihood Option

Aside from crops and animal farming, off- farm activities such as habal-habal driving, sari-sari store, coconut juice producer, and construction laborer are the livelihood options in rain fed communities as shown in

Table 2. Mostly men were engage in habal-habal driving, coconut water producer and laborer while women and children are in sari-sari (vendor) store, and employed either in private or public firms locally and abroad. About 28% was on the construction of government projects and 11.9% were into sari-sari store/vendor, respectively. Only 22.7% of the rain fed farmers has no livelihood options. Farmers who have practiced on commercial level or large scale production had focused on mono-cropping. On the other hand, small scale farmers had diverse livelihood option. To augment farmer's income, alternative livelihood option was practice to sustain its daily needs.

Table 2. Livelihood option of farmers in Agusan del Sur

Livelihood options (multiple responses)	Frequency	Percentage (%)
Habal-habal driving	43	11.1
Sari-sari store/Vendor	46	11.9
Laborer	110	28.4
Tuba producer	8	2.1
Mining	10	2.6
Charcoal making	5	1.3
LGU worker	33	8.5
Timber sawing	2	0.5
Fishing	1	0.3
Pension	1	0.3
Public employment	20	5.2
OFW	10	2.6
Private employment	11	2.8
No livelihood options	88	22.7
Total	388	100.0

This result collaborates with the findings of Quizon et al., (2005) that half of the farm income comes from off-farm livelihoods (employment of family member's domestic and abroad, mining, charcoal making, timber sawing etc.). With the diverse economic activity of the area, opportunities in livelihood occur by shifting from rural agriculture to other sector that had existing market demand of the product. In addition, factors like force majeure, increasing debt, education support and succeeding failure of agriculture production leads to pawning of lands. This implies that other sources of livelihood should be made available in rain fed communities with limited physical and financial resources in order to improve and uplift their economic status. Farm planning and budgeting of resources is recommended to ensure reliable outcomes in farm productivity. In addition, government support and other agriculture service grants in aid would be a great help for the establishment of agricultural programs and projects.

Farm Diversification in Rain Fed Areas

Several crops had been observed and recorded in the study area. Rain fed areas were highly diverse ranging from two to four crops raised with 19.06% to 20.17%, respectively. Crop adaptability, nutritional value of crops, land resource, and financial capability are the most common factors in farm diversification. About 83 percent of the 362 surveyed farmers have practice farm diversification with a range of 2-7 crops. Twenty seven percent planted rice as their major crop followed by vegetables 16.6 percent, banana with 16.5 percent, and root crops with 12.5 percent, respectively.

Production enterprise and integration of native breeds of poultry, native swine, small and large ruminants suited in rain fed communities. Grasses and legumes in the areas are present and served as feeds for poultry and livestock. These poultry and livestock should be included in the farming system approach to optimize agricultural by products like corn fodder and rice straws, thus increasing farm efficiency. Among the animals raised, native chicken recorded the highest of 39% followed by swine, and carabao with 27.59% and 21.37%, respectively.

Table 3. Farm diversification (with multiple responses)

Crop diversification	Frequency	Percentage (%)
7 Crops	7	1.93
6 Crops	32	8.84
5 Crops	46	12.71
4 Crops	69	19.06
3 Crops	72	19.89
2 Crops	73	20.17
1 Crop	63	17.40
Total	362	100
Animals raised		
Native Carabao	134	21.37
Cattle	14	2.23
Goat	36	5.74
Horse	6	0.96
Swine	173	27.59
Native chicken	245	39.07
Ducks	12	1.91
Others	7	1.12
Total	627	100

Estimated Income in Rain Fed Communities

The assessment value of the farmland will depend on soil fertility, climatic condition, irrigation system, access of farm to market road, peace and order situation, and water availability. These factors will contribute to farm productivity, cost effectiveness, and farm efficiency. Rain fed farm is considered as marginalized areas due to the absence of this factors which can lead to poor

Table 4. Estimated cost, gross income, and net return of farm diversification in rain fed areas

Number of Crops Combination	P1-P10,000	P10,001-P20,000	P20,001-P30,000	P30,001-P40,000	P40,001-P50,000	P50,001-P60,000	> P60,000
A. Estimated cost of Production (Php)							
7 Crops	3	3	1	0	0	0	0
6 Crops	19	10	1	1	1	0	0
5 Crops	27	13	4	1	1	0	0
4 Crops	37	23	5	2	2	0	0
3 Crops	38	22	7	2	2	0	1
2 Crops	39	18	10	2	1	3	0
1 Crop	22	27	10	3	1	0	0
Total	185	116	38	11	8	3	1
B. Estimated gross income of Production (Php)							
7 Crops	2	1	3	0	0	0	1
6 Crops	9	8	7	0	0	1	3
5 Crops	14	10	4	5	3	0	10
4 Crops	22	20	4	4	4	3	12
3 Crops	22	19	7	6	3	0	15
2 Crops	33	10	8	6	7	2	11
1 Crop	18	13	10	7	4	1	10
Total	120	81	43	28	21	7	62
C. Estimated net income of production (Php)							
7 Crops	5	1	0	0	1	0	0
6 Crops	18	8	3	1	0	1	1
5 Crops	22	9	6	2	1	3	3
4 Crops	45	8	8	5	0	2	1
3 Crops	47	7	6	2	2	1	7
2 Crops	42	13	7	3	0	3	5
1 Crop	35	11	11	1	3	1	1
Total	214	57	41	14	7	11	18

farm performance. Data shows that most farmers in rain fed communities have a less capital investment ranging from Php 1-10,000 regardless on the level of farm diversification and revealed that most of the respondents had a low gross and net income. In order to attain the desired outcome in agricultural production, government and private sector should invest more to satisfy all the required agricultural inputs throughout the duration of the project. However, very few of the respondents have enough capital investment per cropping with the amount of Php 20,000-30,000 per hectare.

Based on the results of the study, farm diversification is needed in order to beef up the profitability of the farmers in rain fed communities. The combination of rice, corn, vegetables, and coconut revealed the highest gross income of Php 81,700, followed by banana, vegetables, root-crops, trees, and fruit-trees with Php 80,000 per cropping, respectively.

This implies that rain fed area needs to be diversified and integrated to be productive and need to create feasible and viable short and long term solutions on this kind of farming system to attain food security and sustainability, thus contributing to poverty alleviation.

Structural Reforms and Policy in Rain Fed Communities

As shown in Table 5, 11.9% of the respondents were clienteles of government agencies and non-government agencies have access to different financial institutions in the area. Traders/crop assembler is the leading financial source of the farmers (9.1%) followed by the lending institutions (3.6%), private banks (3.3%), cooperative (1.7%) and government banks (0.6%). It implies the government should strengthen and provide more programs and projects especially on the context of financial support and low interest rates in agricultural loans.

Structural reforms and policy programs of the government are present in the area however, based on farmers interview did not much contribute to their production support. Agricultural inputs such as seeds, fertilizer, pesticides, equipment, and facilities were

insufficient amount considering the requirement in the rain fed area. With the scenario given, minimal improvement in terms of the economic activity leading to marginal income of rain fed community.

Table 5. Government agencies, non-government agencies, and financial institutions operating in rain fed communities

Category	Frequency	Percentage
Government agencies	21	5.8
Non-government agencies	22	6.1
Government banks	2	0.6
Private banks	12	3.3
Cooperative	6	1.7
Microfinance/Lending Institutions	13	3.6
Traders/Informal sources	33	9.1
None	253	69.9
Total	362	100

Agricultural Practices in Rain Fed Communities

More than the majority of the farmers in rain fed communities are practicing chemical farming where they are using inorganic fertilizer and chemical based pesticides and insecticides. In terms of time spent in the farm, majority of the respondents has 6 to 8 hours for its application and other farm activities. Farmers started work between 6 to 7 o'clock in the morning and ends at 4 to 5 o'clock in the afternoon. Due to meager income from farm most of the family members (1 -3) employed as laborer and earns less than Php 5,000 a month. Almost all of the respondents were into livestock raising through government livestock dispersal program and personal effort.

In terms of agricultural practices, organic farming, palay check and diversified farming were observed. Farmers suggests that for the project to be effective the following should be done namely; loans with low interest rates, fairness in the distribution of farm inputs, availability of irrigation and drainage, regular visit of technicians/extension workers, sustainable livelihood programs and capability buildings. On the other hand, most of the respondents have no organizational affiliation. However, for those with organization mostly 37.80% were members of farmers association whose organization can avail the services and can access to programs and project of the government, non-government organizations, and other lending institutions in the area.

Glitches in Rain fed Communities

Water management is the main problem in rain fed agriculture. With the climatic condition in the area (Type II) – no dry season with very pronounced wet season of heavy precipitation, average monthly rainfall is 355 mm, and average temperature is 27.15^{O} Celsius. Research and technology innovation can address this problem by establishing watershed and water impounding facilities through solar power pumps and solar drip irrigation. This implies that crops produced in rain fed area should be adaptable and climate resilient varieties enable to perform better yield thus, can sustain farm productivity. Establishment of climate proof agricultural programs and projects need to be studied as adaptation measures to climate change in order to decrease risk and vulnerability. Policy makers, department of agriculture, local government units, and academic institutions may take consideration to develop viable and feasible programs and projects to address issues and concerns in rain fed communities.

Results of farmers interview seeks agricultural assistance in agricultural farm inputs (seeds, fertilizer, pesticides) presence of irrigation system, crop insurance, farm to market roads or inadequate transportation, marketability of products, and high interest rates in loans are common problem which until today needs to give important attention. These problems can contribute to low farm productivity, thus affect farmer's income. This problem remains a challenge to government, private sector, farmers, non-government organization, social entrepreneur's and researchers in improving economic status of rain fed communities.

Table 6. Problems identified in rain fed communities (multiple responses)

Problems encountered by farmers	Frequency	Percentage (%)	Rank
Program of the government was not very organized	156	43.09	7
Lack of trainings and seminars	164	45.30	6
Lack of cooperation	150	41.44	8
Lack of production	170	46.96	5
Inadequate road	180	49.72	4
Inadequate transportation	200	55.25	2
Unfavorable climate condition	291	80.39	1
Dependence on traders as the main market outlet	192	53.04	3
High interest rates from informal sources of funding	140	38.67	9

Results of the Multinomial Logistic Regression Model

Table 7. Multinomial logit regression estimates of the factors influencing the choice of diversification of livelihood options in rain fed communities

Variable	Diversification into agro-processing			Diversification into non-agro processing		
	Coefficient	Standard error	p-value	Coefficient	Standard error	p-value
Constant	21.715	2.796	.000**	32.150	1919.645	.987ns
Age	-.199	.425	.640ns	-.533	.625	.394ns
Farm size	-.468	.765	.540ns	.454	1.352	.737ns
Income	.090	.307	.770ns	10.773	.038	.000**
Gender	1.450	1.170	.215ns	.655	1.652	.692ns
Membership in organization	-0211	1.037	.839ns	-14.223	1216.954	.990ns
Education	.167	.030	.000**	-14.223	1484.601	.992ns
Avail credit	.187	1.029	.856ns	.235	1.663	.888ns

** = significant at 1%
ns = not significant

Based on the data analysis, crop cultivation revealed the most common livelihood practiced in the rain fed communities. The regression model was used as the base category enable to determine the relative effect of each specific predictor on livelihood strategies.

Table 7 shows the result of multinomial logit on the relative likelihood of farmers choosing a particular source of livelihood relative to the base category. The likelihood ratio statistics is significant at 1% level. This implies that at least one variables in the model has a significant influence on farmers' choice of livelihood strategy. Education is the only variable of the seven (7) predictors and found to have a significant influence on household diversification to agro-processing activities while farmers' income had a significant influence on diversification to non-agro-processing activities. Age, farm size, gender, membership in organization and access to credit were found to have no influence on livelihood diversification. This result supports with the findings of Kowurno et al., (2014) who reported that education and income were found to have significant influence on household diversification to agro-processing and non-agro-processing, respectively.

5.0 Conclusion

Rain fed communities are weak in adopting research technologies and development through innovation in the area. Projects for water impounding/catching facilities through mulching, solar power irrigation system, integrated pest and diseases management program shall be incorporated in rain fed farming. It provides long term investment to sustain sources of water needed by crops and livestock. Structural reforms needs to be review and strengthen considering its relevant issues in food security, agricultural land conversion, environmental degradation, and climate change. Application of research outputs and technology driven innovations shall be incorporated from production practices, value adding, and product development to marketing to complete the desired outcome of the project cycle. In addition, agricultural policy awareness during project implementation shall be simple and attainable considering farmer's age and educational attainment. Political intervention shall be minimized which affects its production support to local communities. Profiling of the project was determined based on the group of farmers to assess, record, and analyze the situation in rain fed communities to have equitable distribution of agricultural programs and projects. Socio economic profile in rain fed community concluded to be in poverty line considering marginal income. Livelihood option in the area was very limited considering its economic status, geographical location, and population. Proportional relationship between crop diversification and profit was observed. Study revealed that the more diverse and integrated the farm, the more profit or increase farmer's income was observed. In addition, climate and water management are the major problems in rain fed areas.

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