

# Enhancing economic subsistence: diversification activities and labor intensification as economic setback mitigation in upland agriculture communities

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Enhancing economic subsistence: diversification activities and labor intensification as economic setback mitigation in upland agriculture communities

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## Abstract

To demonstrate that pluriactivities can contribute to the economic condition as a response to economic setback, the diversification activities of upland farmers and the utilization of their available labor pool were used to illustrate that economic well-being is attainable through the use of lucrative undertakings. Using the 1995 and 2015 data to compute two growth years, upland farm household strategies to cope with financial challenges were documented and analyzed. Variables included in the analysis were the socioeconomic status of upland households, the different agricultural phases, the labor types used relative to the different agricultural phases, and the time expended on the use of labor types in relation to the different agricultural phases. Results showed that diversification activities have helped the upland household meet the financial requirements needed for both the farm and households. Recommendations for governments and development planners to undertake development projects for upland communities were discussed.

Keywords: upland farming, livelihood diversification, crop diversification, labor utilization, agricultural phases, poverty

## Introduction

Studies have shown that participation in rural nonfarm employment (RNFE) have contributed to income increase, wealth and even agricultural productivity (Barrett, Reardon, & Webb, 2001; Haggblade, Hazell, & Reardon, 2005). These findings suggest that the correlation between participation and higher income is a way out of poverty (Bezu, Barrett, & Holden, 2012). But, studies of determinants of participation suggested the opposite, that an unequitable access of remunerative nonfarm activities only favors the rich rather than the poor (Barrett et al., 2001; Corral & Reardon, 2001; Davis et al., 2010; Dercon, 2006; Meert, Van Huylenbroeck, Vernimmen, Bourgeois, & Van Hecke, 2005). Thus, there is a good reason to examine the positive trajectories of the correlation.

Studies on economic activities of poor households in the rural areas showed positive trajectories on the contribution of livelihood activities to the well-being of rural household (Avila-Foucat & Rodríguez-Robayo, 2018; Kassie, Kim, & Fellizar, 2017; Mentamo & Geda, 2016; Saha & Bahal, 2015). These studies demonstrated

that the ultimate outcome of pluriactivities was for the improvement of the well-being of household through increase of income and high productivity. Households engaged in numerous activities like trade, handicrafts, services to meet their daily needs (Srisopaporn, Jourdain, Perret, & Shivakoti, 2015). To measure affluence, accumulation of assets became the gauge (Barrett et al., 2001; Ellis & Freeman, 2004; Saha & Bahal, 2016).

Farmers' economic activities have not only improved their financial capacity but also the ecological outcomes associated with the activities. Studies have shown that crop diversification, for instance, have improved soil condition through the cultivation of nitrogen-fixing crops, reduced pest infestation through effective pest management control, and lessened soil run-off or soil erosion (Gaba et al., 2015; Kidane & Zegeye, 2018). Moreover, going beyond the carrying capacity of the natural resource could be prevented by liberalizing access to the different livelihood resources (Kamanga, Vedeld, & Sjaastad, 2009).

However, quantification of farmers' labor expenditures in relation to agricultural phases and their contribution to agricultural productivity was rarely reported in the literature. This is the gap of research that this paper addresses. Most of the discussions on farmers' labor use were placed in broad headlines, leaving out the specific value of time use and their allocation of it in cognizance of their economic activities. This method of inquiry is directed at the understanding farmers' values and needs for time use is expressive of prioritization of needs (Chambers, 1995; Rhoades & Booth, 1982).

The main objective of this paper then is to demonstrate that pluriactivities can contribute to the economic condition of the upland farmers. This paper used the diversification activities of farmers and the utilization of their available labor pool as means of improving their economic condition.

### Theoretical Framework

As a response against uncertainties and as alternative means to increase household income, diversification of livelihood and resources becomes the default response over specialization, and in fact, becomes the norm (Barrett et al., 2001; Kasem & Thapa, 2011; Kyi & Doppler, 2011). This subject was discussed extensively by Altieri (2018), Ellis & Freeman (2004), Kidane & Zegeye (2018), Meert et al (2005), Saha & Bahal (2016), Salvioni, Rondinelli, Esposito, & Henke (2009). Two types of diversification strategies stand out in the literature i.e. livelihood diversification and the agriculture or crop diversification.

### Livelihood diversification

Livelihood diversification is the use of non-specific household assets for non-agriculture activities unconnected to the farm business (Meert et al., 2005) and is associated with increased income (Makate, Wang, Makate, & Mango, 2016). Rural poor farmers diversify by adopting a range of activities, e.g. trade, handicrafts, services, and rents like plow animal rentals, to improve economic condition (Haggblade et al., 2005; Saha & Bahal, 2016; Srisopaporn et al., 2015). Assets accumulated coming from different sources become the measure of wealth and well-being (Barrett et al., 2001; Ellis & Freeman, 2004; Saha & Bahal, 2016).

To understand rural small farmholders' income seeking-behavior, myriads of variables were drawn-out from various econometric models (Avila-Foucat & Rodríguez-Robayo, 2018; Kassie et al., 2017; Mentamo & Geda, 2016; Saha & Bahal, 2016). Among these were household age, environmental consciousness, government regulatory requirements and subsidies, civic engagements, education level, access to credit and other financial resources, perceptions on land tenure, possessions of livestock, and dependency ratio. These studies argued that these variables need to be incorporated into the development plans to ensure farmers' chances of survival and well-being.

Livelihood diversification protects the overutilization of the natural resources, such as the forestland. Forestland resource was one of the sources of farmers' alternative livelihood (Kamanga et al., 2009). In this study, authors demonstrated that households of economically poor farmers constituted the vast majority of forest consumers, implying that limiting the poor households' access to the forest resources could contribute to disparity in income inequalities. But in granting them liberal access to forest resources, pressure on forest resource is inevitable (Vadez, Reyes-García, Huanca, & Leonard, 2008). Hence to lessen the reliance on the use of forest resources, lucrative enterprises should be made available to the rural poor farmers (Nguyen &

Tran, 2018; Wei, Chao, & Yali, 2016). In this study, the authors argued that extremely poor households consumed and utilized forest resource more than their well-off counterparts implying that access to forestlands leads to increase in household per capita income, thereby contributing to the reduction of poverty incidence.

### Agricultural diversification

Agricultural or crop diversification increases household income (Dorsey, 1999) and household resiliency during lean periods (Singh, Kumar, & Woodhead, 2002). It is performed either by growing a variety of crops at one time or by growing different crops in different locations at the same time. Farmers diversify crops for numerous ends (Bosma, Udo, Verreth, Visser, & Nam, 2005).

Aside from financial necessity, crop diversification has non-finance advantage (Kidane & Zegeye, 2018; Makate et al., 2016). These studies reported the practical value of crop diversification e.g. improvement of soil fertility, efficiency of agro-ecological systems which reduces crop production risks, enhances production stability, yields, and improvement of the diversity of human diet, suppression of diseases and pests, weeds, and volunteer crops. Studies concluded that crop diversification promotes ecological balance, reduces farm input use such as fertilizers and pesticides through intraspecies management and mitigation of environmental impacts, reduces pest infestation by preventing their growth, reproduction, or dispersal, and minimizes soil erosion and the associated loss of nutrients by acting directly on soil fertility through nitrogen fixing species such as legumes (Gaba et al., 2015). In conclusion, crop diversification could be implemented for food production as well as ecosystem equilibrium.

Has diversification really improved the lives of the marginalized farm households?

As a response to curb poverty among the marginalized farmers in the rural areas, modernization of agrotechnology improves rural farmers lives and eliminate rural poverty (George, 2014). Lessons from Green Revolution proved that by adoption of new technologies, lives of farmers could be improved and the national production goals could be achieved as well (Gollin, Hansen, & Wingender, 2018; Horlings & Marsden, 2011; Pingali, 2012). However, there were reports in some few studies that farmers rejected the introduced technology of the risk involved in the adoption of modern technology, thus resulting to low income and productivity (Fermont & Benson, 2011; Garibaldi et al., 2017; Loos et al., 2014).

In poverty studies, crop diversification improved farmers' livelihood outcomes (Kasem & Thapa, 2011; Kyi & Doppler, 2011). For instance, in one region in China, a five-year average yield increase was achieved from 67.9% to 97% as a result of crop diversification (Zhang et al., 2016). Similar gains were observed in South Africa (Michler & Josephson, 2017) and in some developing countries like Malawi, Nepal, Vietnam, Pakistan, Nicaragua, Indonesia, Albania, and Panama (Pellegrini & Tasciotti, 2014).

### Allocation of human resources in diversified household

Diversification activities begin at the household (Koomson & Asongu, 2016). Levy (1985), and Zepeda (2006) reported on the economic value of children and their contribution to the agricultural production; Adewale, Oladejo, & Ogunniyi (2005) examined the attitudinal factors of children pertaining the drudgery of agricultural operation; Dinku, Fielding, & Genc (2018) examined the roles children played in the household.

The division of labor by gender has been extensively published in the literature and concluded that women has contributed to agricultural production (Haddad & Reardon, 1993; Matshe & Young, 2004; Neitzert, 1994; Saenz & Thompson, 2017; Shiferaw, Gebremedhin, & Zewdie, 2017; Udry, 1996; Udry, Hoddinott, Alderman, & Haddad, 1995). Saenz (2017) reported on the marketing and production involvement of women; Shiferaw (2017) documented women's access to credit services reporting that some government and nongovernment organizations preferred to extend credit and other financial services to women rather than men for the reason that women's economic activities were in consonance with government's programs. However, Matshe & Young (2004) claimed that some domestic concerns prevented women to fully participate in agricultural production like children's care, household care, and farm support

Accounting of labor and its contribution to agricultural productivity is rarely reported in literature and is

usually placed in broad headlines in ethnographic efforts (Boserup, 1966). The quantification of farm labor can lead researchers to the understanding of the working patterns of farmers both in on-farm and off-farm seasons (Stone, Netting, & Stone, 1990) as well as the prioritization of farmers' needs and the valuation of their resources in relation to their economic condition.

## Method

The data used in this paper were component data of the project "Farm Labor and the Agroecological Management of Upland Rice Farming in Eastern Visayas, Philippines". The research area is primarily agricultural with rice as the principal crop and others such as legumes, coconuts, rootcrops, and cash crops such as banana and vegetable as secondary crops. The area has limited flat lands, surrounded with high mountains with minor creeks flowing towards major creeks of three composing villages. This project detailed upland farmers farming practices.

Secondary data were used in this essay. The data were formal survey interview, personal interviews with upland farmers and key informant, and notes during the participant observation phase. Household units were used as sampling units because they could be conveniently compared with other cultural units (Gross, 1984). Furthermore, it was relatively easy to observe behavior directly in a household or to use a single informant to report on the activities of household members. A total of 57 household units were used in the analysis. Prior informed consent was sought from the research participants prior the conduct of the formal survey, and personal interview with upland farmers and key informant. Furthermore, ethics clearance was granted by the departmental ethics committee of the Provincial Agricultural Office, Province of Leyte, Philippines.

In this article, authors used the 1995 and 2015 data to compute two growth years. Data used in the analysis included among others: socioeconomic status of upland farmers, the different agricultural phases, the labor types used relative to the different agricultural phases, and the time expended on the use of labor types in relation to the different agricultural phases.

Socioeconomic status includes the demographic characteristics of the household units, their livelihood and agronomic activities. Agricultural phases are the different agricultural tasks such as field preparation/ repair (FP), planting/ transplanting/ replanting (PL), weeding and pest management (HR), fertilizer application/ manuring (MA), and harvesting (HA). Labor types are the labor used in the performance of the agricultural phases, and these are the self labor, unpaid family labor, collective or exchange labor, and hired labor. Time expenditure is the amount of time spent in the performance of a task. These were computed in terms of hours expended as estimated by the research participant through the recall method.

## Analysis

In soliciting the time expenditure data, the approximation method, instead of the diary method, was adopted. Approximation method uses the recall method. The farmer research-participant approximates the number of hours or days in an agricultural task. Researchers were very much aware of the inherent weakness of this method but was considered to be a lesser demanding task compared to the diary method (Bernard & Killworth, 1993; Paolisso & Hames, 2010). Descriptive statistics e.g. frequency count, mean, and percentage were used in the analysis. For the computation of the percentage of change, the entry of the final year ( $t_{2015}$ ) is subtracted with the entry of the beginning year ( $t_{1995}$ ) divided by  $t_{1995}$  and then is multiplied by the constant 100.

## Results

Table 1 describes the demographic characteristics of upland farm households in terms of age of household heads, their educational attainment, household size, and number of household dependents. Majority of household heads were advanced in age (40-74 years) and have low educational attainment (2-9 years). Furthermore, household units have high population size (5-11 members) and have many dependents ranging from 5-14 dependents. Not to mention that these were factors of poverty (Jung & Smith, 2007), the data would point out that the farm household units had high overhead expenses like caring for children and the

elderly, and household maintenance. Hence, capital requisites for agricultural endeavours were needed and household heads have to source out the much need capital for agricultural use.

#### Labor management of upland farm household

Farmers allocated a labor type in relation to the agricultural phases. Households utilized four labor types, to wit: the unpaid family labor, self-labor, collaborative/exchange labor, and the hired labor. Self-labor is the type of labor performed by the household heads. In this study, household heads were the research participants. Unpaid family labor is the type of labor performed by every able-bodied member of the household; collective or exchange labor is the labor type extended to the members of the exchange group where reciprocity is the norm of the group, and; hired labor is a form of a contract labor paid by the households.

Table 1. Demographic profile of upland farm household in a rural village in Eastern Visayas, Philippines

Variable	f	%	Mean
<b>Age of household heads</b> 30-34 35-39 40-44 45-49 50-54 55-59 60-64 65-74 Total	4 3 7 5 8 17 6 7 57	7 5 12 9 14 30 11 12 100.00	52.5 (years)
<b>Household Size</b> 0 -2 3 -5 6 -8 9 -11 12 -14 Total	5 22 24 5 1 57	9.0 39.0 42.0 9.0 2.0 100	6
<b>No. of Dependents</b> 0-1 2-3 4-5 6-7 8-9 10+ Total	5 1 19 19 12 1 57	9 2 33 33 21 2 100	6
<b>No. of years in school of household head</b> 0-1 2-3 4-5 6-7 8-9 Total	4 12 16 20 5 57	7 21 28 35 9 100	4.9 (years)

Households utilized the self-labor and the unpaid family labor for the field preparations and paddy repair (FP), weeding and pest management (HR), and fertilizer application (MA) works while the hired labor and unpaid family labor were used during the planting/ re-planting/ transplanting (PL) and harvesting (HA) phases (Table 2). The collective/exchange labor was used as a support labor pool for the FP and PL works.

Table 2. Percentage of change of average labor time input (man/hours) expended by upland households in an agricultural cropping cycle

Labor Types	Field Tasks	Field Tasks	Field Tasks	Field Tasks	Field Tasks	Field Tasks
	*FP	*PL	*HR	*MA	*HA	Total mean
Self	33.70	1.37	11.65	2.50	4.13	53.35
Family	3.68	0.39	5.75	1.64	7.71	19.17
Cooperative	1.21	1.84	0.56	0.13	0.84	4.58
Hired	4.43	5.60	2.14	0.07	6.23	18.47
Total Mean	43.02	8.90	20.10	4.34	18.91	95.57

Legend:

\*FP= field preparation/paddy repair

\*PL = planting/re-planting/transplanting

\*HR= weeding/pest management

\*MA= fertilizer application

\*HA = harvesting

Quantifying labor expended for a cropping season would elucidate how much time farmers would spend in a cropping season. Data showed that most of the time were spent on field preparation and paddy repair. In general, a growth trend of the percentage of change in time expenditure in all agriculture phases was observed. In particular, self-labor has an increase of 33.70% of time input in the FP phase alone and more than 50% of it was used in all phases. Self-labor was used primarily in FP and HR phases, and it was supported by the unpaid family labor. For the whole cropping season, unpaid family labor has almost 20% of time input and was used during the FP (3.68%), HR (5.75%), and HA (7.71) phases. The hired labor was used primarily in the HA (6.23%), PL (5.60%), and FP (4.43%) phases. For a cropping season, an increase of 18.47% time input was incurred using the hired labor. Exchange/ Cooperative labor was the least labor type (4.58%) used by farmers.

Productivity of land units is biased towards capital intensification arguing that productivity cannot be achieved through the use of traditional method of cultivation. Boserup's model of productivity demonstrated that through labor intensification, agricultural production could be achieved. Using this theory to explain farmers' time use and agricultural production, farmers' efforts were concentrated on paddy repair indicating the instability of the paddy system. The data showed a 33.70% increase of time input on the use of the self-labor, implying that instead of hiring labor to do the repair task, farmers did the task themselves. This high increase of self-labor in the repair task was attributed to the numerous weather disturbances that visited the country. A total of 24-26 tropical depressions/ typhoons entered the Philippine area of responsibility (PAR) and Eastern Visayas is a typhoon path.

Other phase where self-labor was primarily utilized was on weeding/harrowing/ pest management phase incurring an 11.65% change of time input. Weeding was done manually, hence this task requires a number of workers. On pest management, farmers avoided the use of pesticides and other chemicals for they were already aware on the disadvantages of using agricultural chemicals. In these tasks, farmers were aided by unpaid family labor.

Exchange labor was the least labor type utilized by upland farmers with approximately 5% increase of time input for the whole cropping cycle. In situation that financial resource is quite scarce, farmers or upland communities need to be aware of the importance of collaborative efforts in the promotion of their goals and objectives. Exchange labor would be of help during labor scarcity, in the performance of multi-worker tasks, and in tasks perceived as being drudgerous. For instance, cooperative labor could be utilized during paddy repair, planting, weeding/ harrowing, fertilizer application, and harvesting seasons. In this manner, the needed cash intended to hire additional labor in the performance of other tasks could be used from some other purposes.

#### Diversification activities of upland farmers

Household units did engage in at least one type of livelihood options or a combination thereof to augment income for the support of the agricultural enterprise and sustenance of the household (Table 3). Livestock-raising, vegetable-raising, and tuba gathering – a local wine from coconut juice – were amongst the most favoured livelihood options undertaken by the households. Produce was sold either within or outside the locality. On the other hand, some household members sought temporary employment either as construction workers or doing some menial jobs as daily wage earners. Income generated from these endeavours was used as added capital for both farm needs and household subsistence. Farmers also employed multiple activities like fishing-vegetable raising and fishing-livestock-vegetable raising which were mostly practiced by farmers. Aside from agriculture-based activities, fishing is the secondary form of livelihood for the catch of the day could be easily converted to cash. However, earnings of the daily wage workers could not be higher than the mandated daily minimum wage because the level of education is one of the factors for getting high paying and gainful employment (Barrett et al., 2001; Ellis & Freeman, 2004; Meert et al., 2005). At the time of this report, the daily minimum wage was pegged at Php 386.00 or US \$7.36 in the global standards. This number is much lower for the agricultural sector.

With rice as the main crop, households cultivated other crops for income augmentation to support both the farm and household needs. In this instance, the cultivation of crops was primarily a combination of perennial and annual crops while in some cases with the introduction of short-term crops or cash crops. For example, majority of the household maintained the banana-coconut combination i.e. an annual crop-perennial crop combination. Similar to other annual and perennial crops, time input requirement is minimal and will not eat up much time allotted for some other activities. Other combinations would include perennial-annual-short term crops. The short-term crops would be the source for immediate cash. In general, this mode of multi-cropping systems has been a product of experience and transmitted knowledge which proved to pay-off efforts of the upland farmers (Kidane & Zegeye, 2018).

Crop diversification served other purposes aside from financial ends like soil erosion or soil run-off. Upland farmers cultivated vegetations like lantana (*Lantana camara*) and mura (*Vetiveria zizanoides*) to minimize soil erosion and improved soil fertility. Farmers explained that when hedgerows are fully established, *mura* has a high-water holding capacity, hence controlling soil run-off.

## Discussion

Unlike the industrial sector who used time to measure one's productivity, the same cannot be used in a farming community where traditional know-how was still persistent in every phase of agricultural task (Stone et al., 1990). Traditional agriculture is equated with experience and the perpetuation of experience is verified through practice over time. Hence, an introduction of something new to the existing practice would entail a high-order of acceptance.

Table 3. Economic profile of the upland farm household other than rice farming

### Variable

<b>Livelihood options other than rice farming</b>	Livestock-raising	Vegetable raising	Wine (tuba) gathering	Carpentry	Fishing
<b>Livelihood options combinations</b>	Fishing-vegetable raising	Fishing-livestock-vegetable raising	Fishing-livestock raising	Fishing-livestock raising	Fishing-livestock raising
<b>Vegetation cultivated other than rice</b>	Banana-coconut	Banana-coconut-legumes	Coconut-legumes	Banana-coconut-root	Banana-coconut-root

The challenge that Philippine agriculturists must face is to interface traditional farming systems with the demands of the new crop varieties. The authors maintained that traditional farming practice could give farmers' an assurance of success for they were familiar with the system that they relied for years and could calculate the risks involved rather than imbibed on something that promises heaven which were full of uncertainties and uncalculated risks (Chambers, 1995; Rhoades & Booth, 1982). Traditional agriculture is characterized by low education and a high economic dependency ratio which further made them adhere to the usual way of doing a task. The only competitive advantage that Philippine farmers have is farming experience. If experience is not taken into account, rejection or modification of introduced technology is possible to happen. For development agents, acceptance, modification, rejection of technology are measures of success of developmental activities (Fujisaka, 1987). The reasons why projects fail because these projects are socially naïve (Dove, 1986; Peluso, 1993), and the naivete lies on the approach of analyzing human behavior.

To beat economic challenges, farmers found it fit to diversify their activities to sustain both the household and farm enterprises. Instead of specializing on rice cultivation, farmers decided to undertake diverse activities like livelihood activities and vegetation cultivation options. This strategy was learned from previous generation. For these farmers, their decisions to diversify have paid-off their efforts which are always accompanied by a rational apportionment of time and resources for the attainment of the desired goals, and these decisions are reflective of values and needs of household members (De Buck, Van Rijn, Roling, & Wossink, 2001; Gladwin, 1980; Greiner, Patterson, & Miller, 2009). For instance, the use of the slash-and-burn method, the tilling of the sloppy areas, the preference on the diversified systems over the specialized systems or the generalized ecosystem manifests cultivators' values, needs, and rationality (Casiño & Casiño, 1976; Eder, 2003, 2010).

Off-farm employment was considered by upland farmers as a buffer resource to augment capital needed for specific agricultural tasks. Employment and other alternative livelihood options assured farmers of steady cash inflow. Income earned from this activity is used to finance some agricultural activities and needs like the needed labor force and farm inputs e.g. seeds and fertilizers.

To minimize overhead expenditures, upland farmers used three labor types that did not cause them financial obligations e.g. self labor, unpaid family labor, and the collective or communal labor. Upland farmers utilized their own labor and the unpaid family labor in all phases of the agricultural cycle although with minimal participation in the planting phase. Collective labor, on the other hand, was only used minimally for upland farmers resorted to its use when there is scarcity of labor or during labor bottlenecks. In synchronized rice farming system, it is expected that synchronization of agricultural tasks is inevitable. Hired labor was used for the field preparation (plowing), planting, and harvesting tasks. With very limited financial resource, livelihood diversification activities were resorted to assure the continuance of the tasks.

By experience, upland farm households have asserted that they were able to improve and meet their needs through the different economic activities. Through their traditional way of farming, they were able to sell some of their produce to the nearby markets and acquired some farm implements for the next cropping cycle.

### Conclusion and Recommendation

It is evident from the discussion that upland farmers' management of land, labor, and capital and the natural resources is a result of a complex interaction among a number of interdependent components of which a cultivator has access to his resources — both human and non-human — to maximize the attainment of goals according to the knowledge he possesses. From this premise, development of relevant and viable technology for marginalized farmers should be grounded in full knowledge of existing farming systems. Evaluation of the program or technology used should also be made on the conformity of the program or technology to the goals, needs, aspirations, and socioeconomic circumstances of the target beneficiaries not solely on the technical performance of technology.

We have to be reminded time and again that the failure of induced development was not factored on the technical aspect of the programs but was placed on the inability of the development planners to understand the cultural behavior of a society. Farmers' environment was formed according to their goals, aspirations, perceived needs and expected benefits. Goals, aspirations, and perceived needs underlie practices, and practices imply decision-making strategies. All these strategies and other similar plans were developed as anti-poverty alleviation solutions.

As a response against poverty, upland farmers resorted to primarily use their traditional way of farming as an adaptive response. The reliance of self-labor, unpaid family labor, and cooperative labor ensured upland farmers' labor needs and facilitated the performance of agricultural tasks. Therefore, labor and farm scheduling would help diminish labor shortage in the case of labor bottlenecks.

Multiple cropping, as wont by the upland farmers, needs more push from government agriculture extension workers for farmers perceived this as buffer resource in times of weather disturbances. Furthermore, adoption of the local way of multiple cropping into the local agricultural pattern is a form of mainstreaming culture in development plans which could ensure farmers' cooperation and thus helped alleviate poverty.

### Conflicts of Interest

None declared.

### Research Ethics

Research clearance to proceed with the study was granted by the departmental ethics committee of the provincial agricultural office (Province of Leyte, Philippines) to use the data of the project.

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## References:

- Adewale, J. G., Oladejo, J. A., & Ogunniyi, L. T. (2005). Economic Contribution of Farm Children to Agricultural Production in Nigeria: A Case Study of Ekiti State of Nigeria. *Journal of Social Sciences* ,10 (2), 149–152. <https://doi.org/10.1080/09718923.2005.11892473>
- Altieri, M. (2018). *Agroecology: The Science of Sustainable Agriculture* . CRC Press (Vol. 448). Taylor & Francis.
- Avila-Foucat, V. S., & Rodríguez-Robayo, K. J. (2018). Determinants of livelihood diversification: The case wildlife tourism in four coastal communities in Oaxaca, Mexico. *Tourism Management* ,69 (June), 223–231. <https://doi.org/10.1016/j.tourman.2018.06.021>
- Barrett, C. B., Reardon, T., & Webb, P. (2001). Nonfarm income diversification and household livelihood strategies in rural Africa: concepts, dynamics, and policy implications. *Food Policy* ,26 (4), 315–331.
- Bernard, H. R., & Killworth, P. D. (1993). Sampling in time allocation research. *Ethnology* , 32 (2), 207–215.
- Bezu, S., Barrett, C. B., & Holden, S. T. (2012). Does the nonfarm economy offer pathways for upward mobility? Evidence from a panel data study in Ethiopia. *World Development* , 40 (8), 1634–1646.
- Boserup, E. (1966). *The Conditions of Agricultural Growth* . Chicago: Aldine Publishing Co.
- Bosma, R. H., Udo, H. M. J., Verreth, J. A. J., Visser, L. E., & Nam, C. Q. (2005). Agriculture Diversification in the Mekong Delta: Farmers' Motives and Contributions to Livelihoods. *Asian Journal of Agriculture and Development* , 2 (1&2), 49–66.
- Casiño, E., & Casiño, E. S. (1976). *The Jama Mapun: a changing Samal society in the southern Philippines* . Cellar Book Shop.
- Chambers, R. (1995). Poverty and livelihoods: whose reality counts? *Environment and Urbanization* , 7 (1), 173–204.
- Corral, L., & Reardon, T. (2001). Rural nonfarm incomes in Nicaragua. *World Development* , 29 (3), 427–442.
- Davis, B., Winters, P., Carletto, G., Covarrubias, K., Quiñones, E. J., Zezza, A., DiGiuseppe, S. (2010). A cross-country comparison of rural income generating activities. *World Development* , 38 (1), 48–63.
- De Buck, A. J., Van Rijn, I., Roling, N. G., & Wossink, G. A. A. (2001). Farmers' reasons for changing or not changing to more sustainable practices: an exploratory study of arable farming in the Netherlands. *The Journal of Agricultural Education and Extension* ,7 (3), 153–166.
- Dercon, S. (2006). Economic reform, growth and the poor: Evidence from rural Ethiopia. *Journal of Development Economics* , 81 (1), 1–24.
- Dinku, Y., Fielding, D., & Genç, M. (2018). Health shocks and child time allocation decisions by households: evidence from Ethiopia. *IZA Journal of Labor Economics* , 7 (1), 4.
- Dorsey, B. (1999). Agricultural intensification, diversification, and commercial production among smallholder coffee growers in central Kenya. *Economic Geography* , 75 (2), 178–195.
- Dove, M. R. (1986). Peasant versus government perception and use of the environment: a case-study of Banjarese ecology and river basin development in South Kalimantan. *Journal of Southeast Asian Studies* , 17 (1), 113–136.
- Eder, J. F. (2003). Of fishers and farmers: Ethnicity and resource use in coastal Palawan. *Philippine Quarterly of Culture and Society* ,31 (3), 207–225.
- Eder, J. F. (2010). Ethnic differences, Islamic consciousness, and Muslim social integration in the Philippines. *Journal of Muslim Minority Affairs* , 30 (3), 317–332.

- Ellis, F., & Freeman, H. A. (2004). Rural livelihoods and poverty reduction strategies in four African countries. *Journal of Development Studies* , 40 (4), 1–30.
- Fermont, A., & Benson, T. (2011). Estimating yield of food crops grown by smallholder farmers. *International Food Policy Research Institute, Washington DC* , 1–68.
- Fujisaka, S. (1987). Filipino upland farmers: informal ethnoscience for agricultural development research. *Philippine Studies* ,35 (4), 403–419.
- Gaba, S., Lescourret, F., Boudsocq, S., Enjalbert, J., Hinsinger, P., Journet, E. P., ... Ozier-Lafontaine, H. (2015). Multiple cropping systems as drivers for providing multiple ecosystem services: from concepts to design. *Agronomy for Sustainable Development* ,35 (2), 607–623. <https://doi.org/10.1007/s13593-014-0272-z>
- Garibaldi, L. A., Gemmill-Herren, B., D’Annolfo, R., Graeb, B. E., Cunningham, S. A., & Breeze, T. D. (2017). Farming approaches for greater biodiversity, livelihoods, and food security. *Trends in Ecology & Evolution* , 32 (1), 68–80.
- George, T. (2014). Why crop yields in developing countries have not kept pace with advances in agronomy. *Global Food Security* ,3 (1), 49–58.
- Gladwin, C. H. (1980). A theory of real-life choice: Applications to agricultural decisions. *Agricultural Decision Making: Anthropological Contributions to Rural Development* , 45–85.
- Gollin, D., Hansen, C. W., & Wingender, A. (2018). *Two blades of grass: The impact of the green revolution* . National Bureau of Economic Research.
- Greiner, R., Patterson, L., & Miller, O. (2009). Motivations, risk perceptions and adoption of conservation practices by farmers. *Agricultural Systems* , 99 (2–3), 86–104.
- Gross, D. R. (1984). Time allocation: A tool for the study of cultural behavior. *Annual Review of Anthropology* , 13 (1), 519–558.
- Haddad, L., & Reardon, T. (1993). Gender bias in the allocation of resources within households in Burkina Faso: A disaggregated outlay equivalent analysis. *The Journal of Development Studies* ,29 (2), 260–276. <https://doi.org/10.1080/00220389308422273>
- Haggblade, S., Hazell, P., & Reardon, T. (2005). The rural nonfarm economy: Pathway out of poverty or pathway in? In *International Food Policy Research Institute. The future of small farms. Proceedings of a research workshop, Wye, UK* (pp. 151–178).
- Horlings, L. G., & Marsden, T. K. (2011). Towards the real green revolution? Exploring the conceptual dimensions of a new ecological modernisation of agriculture that could ‘feed the world.’ *Global Environmental Change* , 21 (2), 441–452.
- Jung, S. Y., & Smith, R. J. (2007). The Economics of Poverty: Explanatory Theories to Inform Practice. *Journal of Human Behavior in the Social ...* , 16 (2003), 21–40. <https://doi.org/10.1300/J137v16n01>
- Kamanga, P., Vedeld, P., & Sjaastad, E. (2009). Forest incomes and rural livelihoods in Chiradzulu District, Malawi. *Ecological Economics* , 68 (3), 613–624. <https://doi.org/10.1016/j.ecolecon.2008.08.018>
- 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. <https://doi.org/10.1016/j.landusepol.2010.12.001>
- Kassie, G. W., Kim, S., & Fellizar, F. P. (2017). Determinant factors of livelihood diversification: Evidence from Ethiopia. *Cogent Social Sciences* , 3 (1), 1369490. <https://doi.org/10.1080/23311886.2017.1369490>
- Kidane, M. S., & Zegeye, E. W. (2018). Crop diversification and productivity in semiarid and sub-humid maize-legume production systems of Ethiopia. *Agroecology and Sustainable Food Systems* ,42 (10), 1106–1127. <https://doi.org/10.1080/21683565.2018.1505679>

- Koomson, I., & Asongu, S. A. (2016). Relative Contribution of Child Labour to Household Farm and Non-Farm Income in Ghana: Simulation with Child's Education. *African Development Review* , 28 (1), 104–115.
- Kyi, T., & Doppler, W. (2011). Impact of Crop Diversification on Income Generation of Beneficiaries under Rice Based Irrigated Farming System of Myanmar. *Asia-Pacific Journal of Rural Development* , 21 (1).
- Levy, V. (1985). Cropping pattern, mechanization, child labor, and fertility behavior in a farming economy: Rural Egypt. *Economic Development and Cultural Change* , 33 (4), 777–791.
- Loos, J., Abson, D. J., Chappell, M. J., Hanspach, J., Mikulcak, F., Tichit, M., & Fischer, J. (2014). Putting meaning back into “sustainable intensification.” *Frontiers in Ecology and the Environment* , 12 (6), 356–361.
- Makate, C., Wang, R., Makate, M., & Mango, N. (2016). Crop diversification and livelihoods of small-holder farmers in Zimbabwe: adaptive management for environmental change. *SpringerPlus* , 5 (1135), 1–18. <https://doi.org/10.1186/s40064-016-2802-4>
- Matshe, I., & Young, T. (2004). Off-farm labour allocation decisions in small-scale rural households in Zimbabwe. *Agricultural Economics* , 30 (3), 175–186.
- Meert, H., Van Huylenbroeck, G., Vernimmen, T., Bourgeois, M., & Van Hecke, E. (2005). Farm household survival strategies and diversification on marginal farms. *Journal of Rural Studies* , 21 (1), 81–97.
- Mentamo, M., & Geda, N. R. (2016). Livelihood diversification under severe food insecurity scenario among smallholder farmers in Kadida Gamela District, Southern Ethiopia. *Kontakt* , 18 (4), e258–e264. <https://doi.org/10.1016/j.kontakt.2016.09.003>
- Michler, J. D., & Josephson, A. L. (2017). To Specialize or Diversify: Agricultural Diversity and Poverty Dynamics in Ethiopia. *World Development* , 89 , 214–226. <https://doi.org/10.1016/j.worlddev.2016.08.011>
- Neitzert, M. (1994). A Woman's Place: Household Labour Allocation in Rural Kenya. *Canadian Journal of Development Studies / Revue Canadienne d'études Du Développement* , 15 (3), 401–427. <https://doi.org/10.1080/02255189.1994.9669567>
- Nguyen, T. V., & Tran, T. Q. (2018). Forestland and rural household livelihoods in the North Central Provinces, Vietnam. *Land Use Policy* , 79 (March), 10–19. <https://doi.org/10.1016/j.landusepol.2018.07.046>
- Paolisso, M., & Hames, R. (2010). Time diary versus instantaneous sampling: A comparison of two behavioral research methods. *Field Methods* , 22 (4), 357–377.
- Pellegrini, L., & Tasciotti, L. (2014). Crop diversification, dietary diversity and agricultural income: empirical evidence from eight developing countries. *Canadian Journal of Development Studies / Revue Canadienne d'études Du Développement* , 35 (2), 211–227. <https://doi.org/10.1080/02255189.2014.898580>
- Peluso, N. L. (1993). Coercing conservation?: The politics of state resource control. *Global Environmental Change* , 3 (2), 199–217.
- Pingali, P. L. (2012). Green revolution: impacts, limits, and the path ahead. *Proceedings of the National Academy of Sciences* , 109 (31), 12302–12308.
- Rhoades, R. E., & Booth, R. H. (1982). Farmer-back-to-farmer: A Model for Generating Acceptable Agricultural Technology. *Agricultural Administration* , 11 , 127–137. [https://doi.org/10.1016/0309-586X\(82\)90056-5](https://doi.org/10.1016/0309-586X(82)90056-5)
- Saenz, M., & Thompson, E. (2017). Gender and policy roles in farm household diversification in Zambia. *World Development* , 89 , 152–169.
- Saha, B., & Bahal, R. (2015). Factors Leading to Success in Diversified Occupation: A Livelihood Analysis in India. *The Journal of Agricultural Education and Extension* , 21 (3), 249–266. <https://doi.org/10.1080/1389224X.2014.927372>

- Saha, B., & Bahal, R. (2016). Livelihood diversification pursued by farmers in West Bengal. *Indian Research Journal of Extension Education* , 10 (2), 1–9.
- Salvioni, C., Rondinelli, V., Esposito, L., & Henke, R. (2009). *Diversification strategies in small farms in Italy* .*Economia* . <https://doi.org/10.14601/EDA-8975>
- Shiferaw, K., Gebremedhin, B., & Zewdie, D. L. (2017). Factors affecting household decision to allocate credit for livestock production: Evidence from Ethiopia. *Agricultural Finance Review* ,77 (4), 463–483. <https://doi.org/10.1108/AFR-06-2016-0062>
- Singh, R. B., Kumar, P., & Woodhead, T. (2002). Smallholder farmers in India: Food security and agricultural policy. *RAP Publication* ,3 .
- Srisopaporn, S., Jourdain, D., Perret, S. R., & Shivakoti, G. (2015). Adoption and continued participation in a public Good Agricultural Practices program: The case of rice farmers in the Central Plains of Thailand. *Technological Forecasting and Social Change* , 96 , 242–253.
- Stone, G. D., Netting, R. M., & Stone, M. P. (1990). Seasonally, labor scheduling, and agricultural intensification in the Nigerian Savanna.*American Anthropologist* , 92 (1), 7–23.
- Udry, C. (1996). Gender, agricultural production, and the theory of the household. *Journal of Political Economy* , 104 (5), 1010–1046.
- Udry, C., Hoddinott, J., Alderman, H., & Haddad, L. (1995). Gender differentials in farm productivity: implications for household efficiency and agricultural policy. *Food Policy* , 20 (5), 407–423.
- Vadez, V., Reyes-Garcia, V., Huanca, T., & Leonard, W. R. (2008). Cash cropping, farm technologies, and deforestation: what are the connections? A model with empirical data from the Bolivian Amazon.*Human Organization* , 384–396.
- Wei, D., Chao, H., & Yali, W. (2016). Role of income diversification in reducing forest reliance: Evidence from 1838 rural households in China.*Journal of Forest Economics* , 22 , 68–79. <https://doi.org/10.1016/j.jfe.2015.12.002>
- Zepeda, L., & Kim, J. (2006). Farm parents’ views on their children’s labor on family farms: A focus group study of Wisconsin dairy farmers.*Agriculture and Human Values* , 23 (1), 109–121.
- Zhang, W., Cao, G., Li, X., Zhang, H., Wang, C., Liu, Q., . . . Jiang, R. (2016). Closing yield gaps in China by empowering smallholder farmers. *Nature* , 537 (7622), 671.