Impact of Labour Market Policies on Farm Households in the Philippines

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1. Introduction

High incidence of poverty is one of the major problems that beset developing countries. In the Philippines, the persistence of poverty is a concern for the government. Literature shows that the poor in LDCs are often disproportionately located in the rural areas and are usually engaged in agriculture or allied rural occupations. In the Philippines too, the incidence of poverty is high in rural areas. Most of the rural poor are engaged in farming. They usually have limited access to formal credit and social services. They are highly dependent on agriculture as their main source of income. High levels of underemployment are also common among poor households.

In a labour surplus country such as the Philippines, policies that affect the labour market are crucial. Governments must take into consideration both the characteristics of labour markets and effects of policies and interventions on these markets. Neglecting these aspects may lead to worsening unemployment, underemployment and poverty problems.

In this paper, we examine the impact of increasing off-farm employment opportunities and of higher wage rates on farm households in the Philippines. A mathematical programming model of a farm household was developed for a selected farming system, and used to explore the impact of labour market policies on the farm household. Impacts were assessed in terms of the productive activities of household members and the welfare of the farm household. We also use the model to examine the effects of off-farm employment and wage rate on the income of farm households.

2. Poverty and unemployment in the Philippines

Successive governments in the Philippines have attempted to lower unemployment levels, yet the rate of unemployment remains high. The reported unemployment rate in the Philippines in 1998 was 9.6 per cent (NSCB 1999). For a country of about 76 million people, this is alarmingly high. The

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underemployment rate, which is the proportion of employed persons wanting additional hours of work, was higher at 23.7 per cent. In addition, the unemployment rate has been increasing recently, from about 7.4 per cent in 1996 to about 7.9 per cent in 1997 and 9.6 per cent in 1998 (NSCB 1999). In rural areas, the percentage of unemployed has also increased from around 7 per cent in 1993 to around 9 per cent, which translates to 1.4 million people in 1995.

According to Farooq (1985), employment problems in many LDCs are deeply embedded in their socio-economic structures, particularly the demographic base, which accounts for some 90 per cent of the growth in the labour force. The employment level of a country is affected by both the supply and demand for labour. Labour supply is determined, *inter alia*, by the size of the population and the age-sex structure of the population which is, in turn, determined by the interplay of fertility, mortality, migration and participation rates. On the other hand, the demand for labour is affected by economic growth, the level and type of industrialisation, factor prices and the choice of technology (Farooq 1985).

In the Philippines, population grew at an average of 2.3 per cent annually from 1980 to 1990 (NSCB 1992). There was a corresponding increase in the labour force which, during the period 1980 to 1990, increased at an average of 3.5 per cent annually (NSCB 1989, 1992). A large part of the growth came from the female members of the working age population (presumably partly due to an increase in female participation rates) (Balisacan 1992). Unfortunately, the country was not able to absorb the rapidly expanding labour force (Bautista 1994), particularly in rural areas where the supply of labour far exceeded the demand. Today, the estimated population growth rate is about 2.13 per cent (NSCB 1999).

In general, employment generation in the Philippines has been relatively poor (Balisacan 1988, 1992; Bautista 1994). Despite rapid agricultural growth in the 1960s to 1980, the economy was not able to generate enough employment to absorb the existing unemployed let alone new entrants in the labour market. The rate of growth of the population exceeded that of employment growth, hence contributing to the continuing unemployment problem in the country. Unfortunately, as pointed out by Balisacan (1992), the problems of unemployment, underemployment and poverty are interrelated and have been influenced by the economic, socio-cultural and political environment including the national development strategies and policy programs (James 1981; Balisacan 1988, 1992; Bautista 1994).

Past policies have tended to be biased towards industrial development, which unfortunately failed to generate enough employment opportunities to absorb the growing labour force (Balisacan 1992, Bautista 1994). Consequently, unemployment and poverty have continued to be major problems in the country.

In the development literature, various strategies to reduce poverty and unemployment have been suggested. Such strategies include promoting economic opportunities through price mechanisms, credit provision to farm households, investment in human capital, agricultural development via labour-intensive methods, infrastructure development and changes in labour market policies.

In the Philippines, recent governments are refocussing efforts and putting more emphasis on the development of rural labour markets. Under labour market reforms, several schemes can be tried out. These include public employment schemes, implementing programs/projects for small-scale industry to provide alternative employment to farm workers, providing remunerative off-farm and non-farm employment opportunities in rural areas, promoting agricultural processing and accelerating the dispersal of industries, and expanding labour policies to include workers in the informal sector.

The success in the design of such schemes depends on planners and policy makers having a good understanding of farm-household systems and the potential impacts of schemes on these farm households. In many cases, governments work on tight and limited budgets and can ill-afford mistakes. Therefore, models that provide insights into the impacts of policies and strategies can help in assessing alternative policy scenarios and hopefully avoid or at least, minimise, costly mistakes.

3. A model to investigate impacts of labour policies

When modelling farm households, an understanding of both the farm-household relations and the farming systems is important. One must understand the goals and behaviour of the farm household, how decisions are made, the roles undertaken by household members and the environment faced by the farm household including the risks associated with farming.

3.1 Characteristics of the farm households

The study area chosen is located in Misamis Oriental, in Southern Philippines. This is an upland area, with rice and maize as the main crops grown. The system modelled is a crop-livestock farming system. The average size of households in the survey is 5.33 members or 3.33 adult equivalents.

Among the 75 households surveyed, 96 per cent are male-headed. This follows the dominant trend in the Philippines where the household is mostly patriarchal. More than half of the respondents (52 per cent) operate lands less than or equal to 1 ha. About 31 per cent operate lands between 1.1 and 3 ha, while around 17 per cent operate more than 3 ha.

Table 1 shows the general characteristics of the farm households surveyed. The average age of the husband is 40 while that of the wife is 37 years. On average, there are three children per household. The mean years of formal schooling of both husbands and wives are approximately 6 years.

Table 1: General characteristics of the farm households

Age (average years)		
husband	40	(15.72)
wife	37	(14.11)
Number of children (average no.)	3	(2.22)
Schooling (average years)		
husband	6	(2.78)
wife	6	(3.59)
Household type (no.)		
farmer-operator	71	
farmer-labourer	4	
Average land operated (ha)	2.1	

* Figures in parenthesis are standard deviations

As in most farm households in the Philippines, decision making is shared between men and women, with some areas of decision making (such as crop production, production of large livestock) predominantly male, while others (such as cottage industries, domestic chores) predominantly female. Household members of both genders also contribute in performing the tasks, again with dominant spheres of responsibility in some areas, while no clear gender division of labour in others (Rola-Rubzen 1997).

In the study, the presence of risk is a major factor that farm-households have to contend with. Since the area is fully rainfed, agricultural production is mostly at the mercy of the environment. Farmers face yield risk due to pests and diseases, weather conditions, and temperature conditions. Both droughts and typhoons are common hazards. Farmers also face price uncertainty from both market instability and unpredictable changes in government policies. Moreover, these farmers have limited access to relevant information about their decision-making environment.

3.2 A mathematical programming model of a farm household

Because of the constrained environment in which the farm household operates, and partly because the main purpose of the model was for the analysis of policy simulations, mathematical programming (MP) was used to quantitatively model the farm.

To reflect the actual workings of the farm household, the model constructed takes into consideration intra-household dynamics. Also considered were the characteristics of the systems being modelled, the environment faced by decision makers, and the behaviour and the goals of the decision makers. Risk was also taken into account in the modelling process with the risk preference of the decision makers included in the mathematical model.

The model is comprised of 338 rows and 365 columns representing the consumption, technical and resource constraints and the various activities included in the model. The activities include the various crop production activities and animal production activities. Since the intra-household aspects were considered, the domestic activities such as household chores and home gardening were also included in the model. Home gardens provide food (fruit and vegetables) and supplementary income to the household. Domestic chores are necessary for the welfare of all household members, and include tasks such as cooking food, house cleaning and taking care of children, the sick and the elderly.

Labour hiring activities were also included. Labour hiring was differentiated by gender in keeping with the focus of the study on gender issues. Similarly, the labour selling activities were differentiated by gender. Processing activities were also taken into consideration in the model. These activities represent the transformation of unprocessed products into more highly processed forms with the utilisation of labour. Leisure activities, differentiated by gender were likewise included in the model.

Other activities included were home consumption activities. These include consumption of rice, maize, cassava, home garden produce, eggs, meat and milk. Marketing activities, which include buying and selling activities, were likewise included in the matrix. Selling activities include selling crop produce (*i.e.*, paddy, maize, cassava), home garden produce and animal produce (*i.e.*, eggs and meat). Buying activities include buying milled rice, milled maize, meat, and other food items. Finally, fodder activities, differentiated into wet season and dry season feed, were also included in the model.

The farm-households in the study area face some technical and resource constraints. These were reflected in the model. Computation of coefficients was based on the survey data supplemented with regional data available from government agencies in the Philippines.

Land was one of the important resource constraints identified. There were two cropping seasons – the wet season, which extended from April to September and the dry season, which extended from October to March. Land may be double cropped, especially where short-duration crops such as rice and maize are planted. Hence, land was accordingly classified by season (wet land and dry land).

Rotational constraints were included to ensure that model solutions are in keeping with those practised in the area. Labour constraints were also reflected in the model. Other factors included were linkages between the crop and animal sectors in the farming systems, and constraints relating to the domestic activities. The matrix included a household tie row, set equal to one, to force in the required level of domestic activities and home gardens, as well as transfer rows and marketing constraints.

Consumption constraints were also added, and include such constraints as minimum protein, minimum energy, minimum cereals and minimum home garden produce (fruits and vegetables). Borrowing and

cash constraints were also added in the model. There were two sources of credit in the study area – the informal sector and the cooperative. At the time of the survey, borrowing from the cooperative was only available for men. There was also a credit limit on loans from the cooperative as credit was rationed. The main source of credit for women was the informal sector (private moneylenders). Since most private moneylenders were operating on a small capital basis, an upper bound was imposed on borrowings from this source. Consequently, two borrowing activities were included (essentially one for men and one for women), each constrained with a credit limit. Terminal cash positions were also included, again differentiated for men and women to indicate the individual who controls the income accrued.

Finally, eight states of nature were included for the production activities to approximate the stochastic nature of the production environment. Both yields and prices were also treated as stochastic and constructed for the eight states of nature. Since the yields of crops were all stochastic, processing activities, consumption, selling, buying, fodder and the terminal cash positions were also stochastic and were duplicated for each of the eight states of nature. Consequently, the corresponding constraints, consumption requirements and marketing activities were also duplicated for each state of nature. Finally, the stochastic nature of the cash constraints for the two critical periods and the terminal cash positions for men and women were also reflected in the eight states of nature.

To facilitate modelling of risk variables, discrete stochastic programming was utilised. The objective was to maximise the expected utility of the farm household, subject to resource and technical constraints across a number of different states of nature assumed to have an equally likely probability of occurring. The utility function was of a negative exponential form and is mathematically represented as:

maximise	$E(U)$	$=$	$\sum_{t=1}^{8} p_t U(Z_{st})$	
subject to :	$A_1 x_1$	$\leq$	b_1	
	$L_{1t} x_1 + A_{st} x_{2t}$	$\leq$	b_{st}	
	$C_{st} x_{st} - Iz_{st}$	$=$	f_{st}	
and	x_1, x_{st}	$\geq$	$0,$	$t = 1, \ldots T$

where: U = utility function;

p_t = vector of state probabilities;

$U(z_{st})$ = vector of utility values for state t;

A_1 = matrix of technical coefficients of first stage activities;

x_1 = vector of first stage activity levels or decisions;

b_1 = vector of first stage resource availabilities;

L_{1t} = set of matrices linking first and second stage activities for state t;

A_{st} = set of matrices representing technical coefficients of second-stage activities for each state *t*;

x_{st} = vector of second-stage activities for state *t*;

b_{st} = right-hand-side vector constraining second-stage decisions for state *t*;

C_{st} = vector of per unit activity net revenues for state *t*;

I = identity matrix to connect stage *s* variables for each state *t*;

Z_{st} = variables to measure total revenue for state *t*; and

f_{st} = vector of fixed costs for state *t*.

For each state *t*, the utility function can be expressed as follows:

$$U_t = 1 - e^{-cyt}$$

where : U_t = utility in state *t*;

c = coefficient of absolute risk aversion; and

y_t = income in state *t*.

A number of decision theorists (Anderson, Dillon and Hardaker 1977, Keeney and Raiffa 1976, Hardaker, Huirne and Anderson 1997) have advocated the use of certainty equivalents[2] of the alternative risky prospects mainly because it is easier to understand certainty equivalents (CE) than expected utility. In addition, converting to CEs avoids the problem of comparing utility values defined on arbitrary scales. Since CEs are in the same unit or scale, they can be manipulated with ease and can be easily interpreted.

Hence, converting to certainty equivalents,

$$U = 1 - e^{-cx}$$

rearrange:

$$1 - U = e^{-cx}$$

taking logs:

$$\ln (1-U) = -cx$$

therefore :

$$x = -\ln (1-U) /c$$

where x denotes certainty equivalent and U and c are as previously defined.

[2] Certainty equivalent refers to the amount exchanged for a particular risky prospect with certainty in which the subject or decision maker is indifferent between the exchange and the risky prospect (Hardaker, Huirne and Anderson 1997).

Using the additive joint utility approach developed in a paper also presented in this conference (Rola-Rubzen and Hardaker 1999):

$$U_H = \sum_{i=1}^{n} \lambda_i U_i$$

where: U_H = household utility function;
U_i = utility of individual *i*;
λ_i = weight of individual *i*'s utility.

Therefore:

$$U_H = \lambda_m U_m + (1-\lambda_m) U_f$$

where : U_m = utility of males;
U_f = utility of females;
λ_m = weight of males' utility function.

To incorporate the multiple objectives of the representative farm household, objectives identified such as income and leisure subject to consumption requirements and resource and technical constraints are reflected in the model. Hence, we can define U_m and U_f as:

$$U_m = U [C_m + (L_m) (RPL_m)]$$

and

$$U_f = U [C_f + (L_f) (RPL_f)]$$

where the subscripts *m* and *f* refer to male and female, respectively; *C* refers to the net amount of cash income earned within the areas of the farm-household economy that are conventionally controlled by each gender; *L* refers to leisure (*i.e.* the total number of hours free of work); and *RPL* refers to the reservation price of labour.

We assume constant absolute risk aversion and a deterministic leisure component, so converting the previous two equations to certainty equivalents,

$$CE_m = CE(C_m) + [(L_m) (RPL_m)] \quad \text{and}$$

$$CE_f = CE(C_f) + [(L_f) (RPL_f)]$$

That is, the certainty equivalent of the males' utility is equal to the sum of the certainty equivalent of the net amount of cash income earned by the farm-household which is conventionally controlled by men (assumed to be the primary male or the husband), and the value of leisure of the males. Conversely, the certainty equivalent of the utility of females is equal to the certainty equivalent of the net cash income of the household controlled by women (assumed to be the wife or the primary female) plus the value of leisure of the females.

Therefore the objective function to be maximised for the joint utility model can be represented by:

$$U_H = \lambda_m (CE_m) + [(1-\lambda_m) CE_f]$$

which means the objective function of the farm-household is to maximise the weighted sum of the utility of the males and the utility of the females, represented by the weighted certainty equivalents of the utilities of males and females. Although the effect of varying lambda was examined in the study, it was assumed for the first part of the analysis reported below that the utilities of males and females have equal weights, hence lambda takes the value of 0.5.

4 Assessing impacts of labour policies on farm households

There are three main policy scenarios examined in this paper. These are (a) the impact of increased off-farm employment opportunities, (b) the impact of employment generation for women, and (c) the impact of wage rates. The impact of these policies would be assessed in terms of the differential effects on the productive activities and incomes and welfare of men and women and on the farm household.

4.1 Effects of off-farm employment opportunity

The first policy experiment conducted involved varying the level of off-farm employment availability. The results of the modelling experiment are illustrated in Figure 1. As shown in Figure 1, the total area cropped is not affected by the off-farm work availability, but the levels of off-farm work undertaken by male and female household members increase as more off-farm employment becomes available. Swine production is not affected and remains at 1 head regardless of the level of off-farm work available. The number of poultry raised initially stays at 9 laying hens then decreases as more off-farm work becomes available and the household takes on more of the available off-farm work. Household utility and the expected cash income of males and females increase proportionately with off-farm employment. Conversely, leisure time of males and females decrease as they give up more of their leisure time in return for work outside the farm and consequently higher incomes.

It appears that the availability of off-farm employment has a positive effect of the farm household in terms of increases in income of both males and females. A trade-off in leisure time is involved, but the impact on the total household welfare is positive. Hence, a policy that would increase employment opportunities will have a positive effect on the farm household, which will also have an impact on poverty alleviation.

To examine the effects of varying the reservation price of labour (RPL), an experiment was conducted whereby RPL was changed from zero to ₱13.12, thrice the level of the assumed wage rate in the base model, with the level of off-farm work left unconstrained. Increments of 25 per cent of the wage rate (below and above) were used for the parametric analysis of the RPLs. As shown in Figure 2, changes in RPL have very little effect on cropped area up to the level where RPL is equal to about ₱6.5. Thereafter, the area cropped decreases with increases in the level of RPL. The off-farm work of males is only slightly affected by the RPL between zero and ₱4.38. However, when RPL is equal to about ₱5.5 (approximately 25 per cent above the assumed wage rate), both males and females do not undertake off-farm employment. The effect of RPL on animal husbandry is negligible.

As shown in Figure 2 (b), household utility first increases gradually between zero and ₱4.38, then at a faster rate. With regard to expected cash incomes, there is a sudden decrease in the CE expected cash incomes between ₱4.38 and ₱5.5 for males and females. Thereafter, the decrease in the CE expected cash incomes slows down. The effect of RPL on the leisure time is reverse of the effect on cash income. Changes in the leisure time of males and females are fairly small between zero and ₱4.38, but jump substantially between ₱4.38 and ₱5.5. After ₱5.5, male and female leisure times increase at a more gradual rate. The expected cash income and leisure time of males are more sensitive to changes in RPL than the expected cash income and leisure time of females.

Figure 1: Effects of availability of off-farm work on the level of off-farm work, cropped area, CE expected household utility, CE expected cash income and leisure time

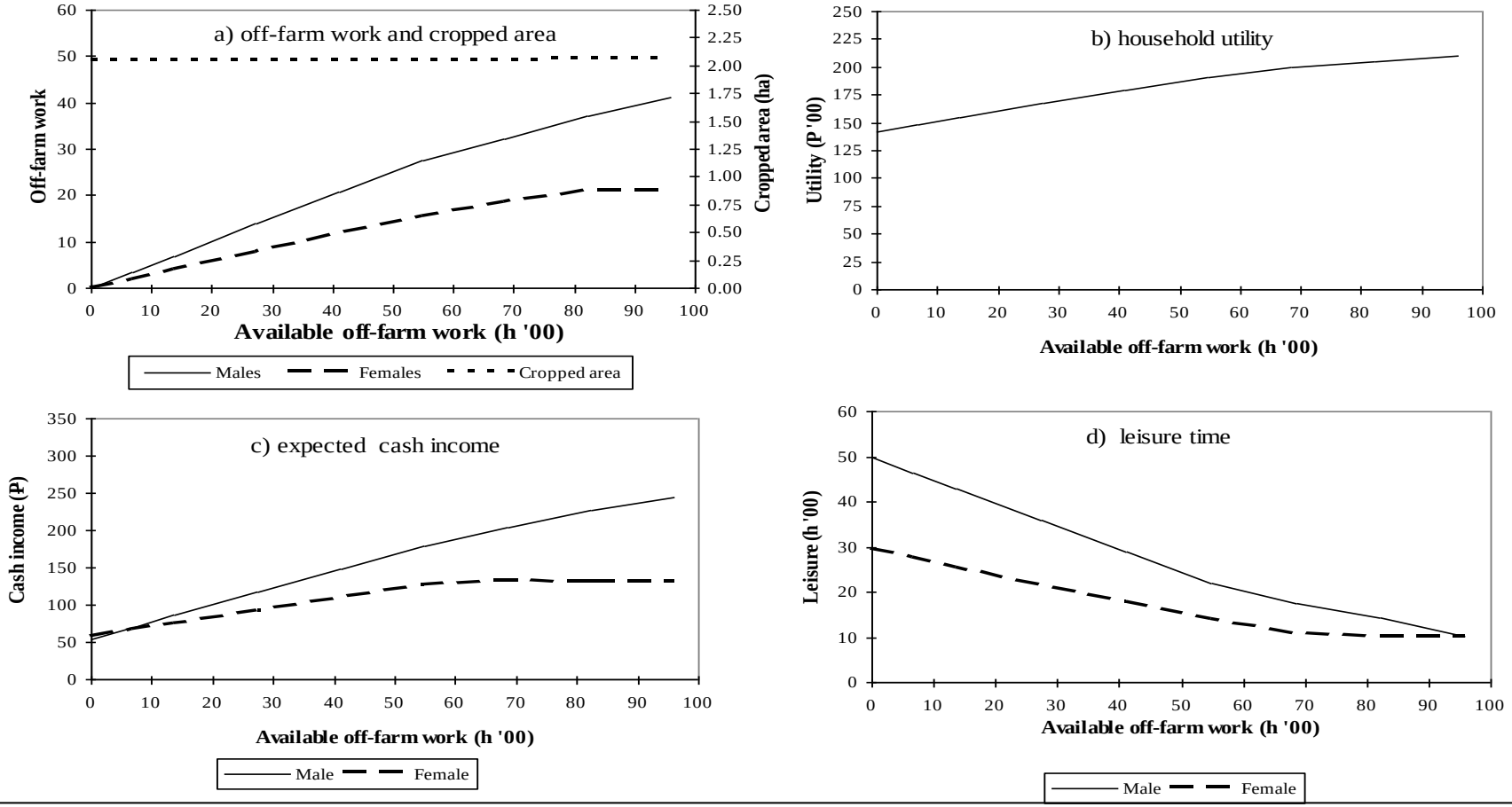
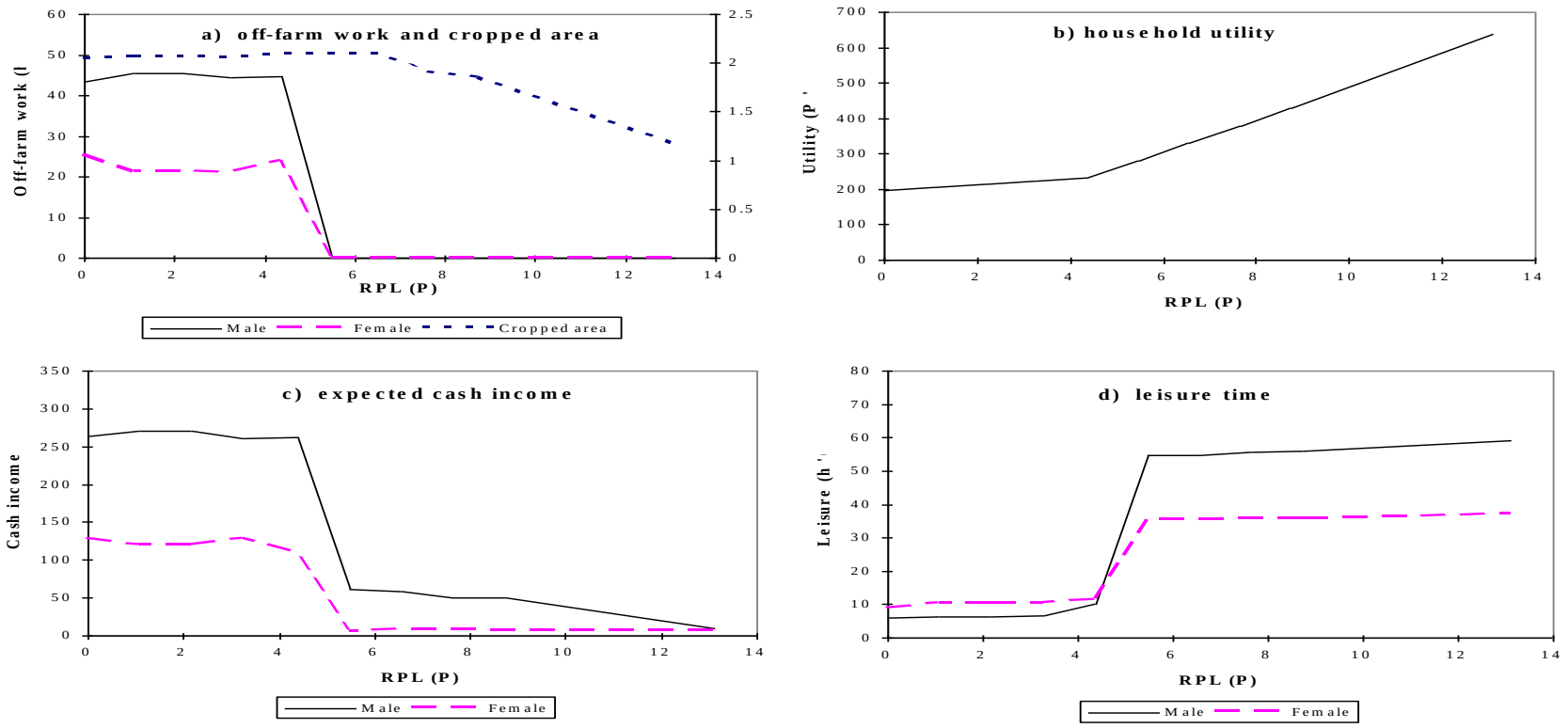


Figure 2: Effects of RPL on off-farm work, cropped area, CE expected household utility, CE expected cash income and leisure time



4.2 Impact of employment generation for women

A major feature of the current government's labour market policy is the incorporation of gender concerns in its employment-generation strategy. For instance, the government has made a commitment to promote investments that generate greater employment for both men and women. Some projects are designed to target specifically rural women. Changes in labour market conditions may influence the balance within the household. To examine the effects of variations in the respective weights of the utilities of males and females, a parametric analysis varying lambda was conducted. In this experiment, lambda was varied from 0 to 1, while the constraints on the off-farm work availability were removed to examine how changes in lambda would affect farm and off-farm activities of household members. The results are illustrated in Figure 3.

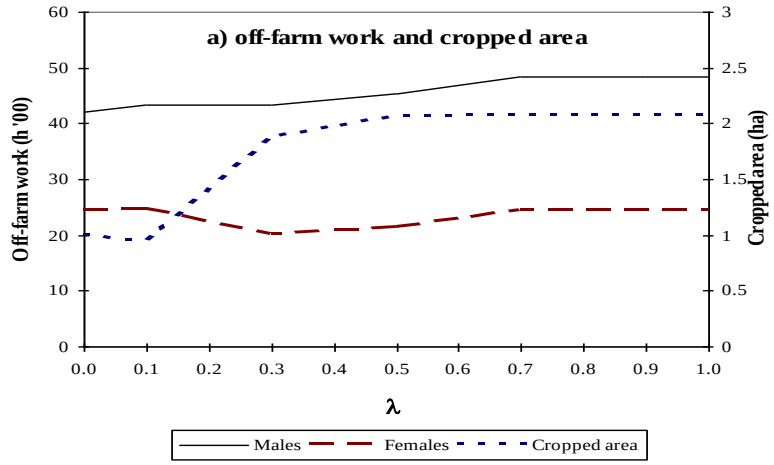
As shown in the figure, as lambda is increased from 0 to 0.5, the area devoted to growing crops also increases. The increase is more significant between 0.1 and 0.3, after which the increase becomes gradual up to 0.5. From this point onwards, the area remains fairly constant with further increases in lambda. The off-farm work of males increases between 0.1 and 0.7, then slightly decreases from 0.7 to 1. On the other hand, the off-farm work of females first slightly increases then decreases up to 0.3. After this point, the off-farm work of females increases up to 0.7 where it tapers off.

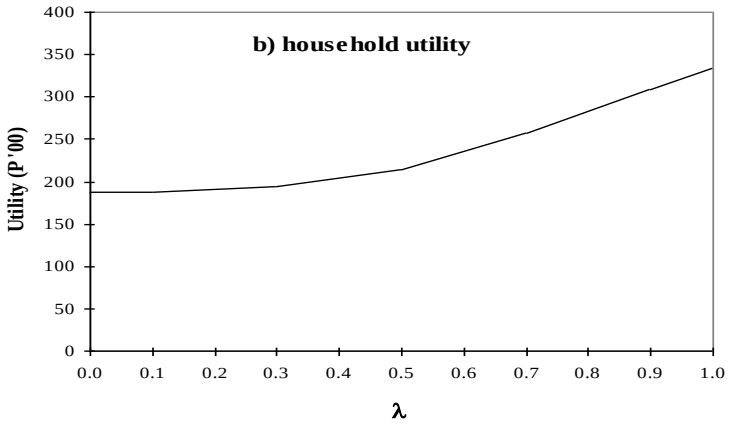
The CE expected utility of the household shows an increasing trend as lambda is increased. The CE expected cash income of males increases and peaks at 0.7, then tapers off. For females, on the other hand, the CE expected cash income decreases up to 0.7 whereupon it tapers off. The leisure time of females increases at a fast rate as lambda goes from 0.1 to 0.5, then the increase slows down. For males, increasing lambda is accompanied by a decrease in leisure time, particularly from 0.1 to 0.5. Further changes in the leisure time are negligible after 0.5.

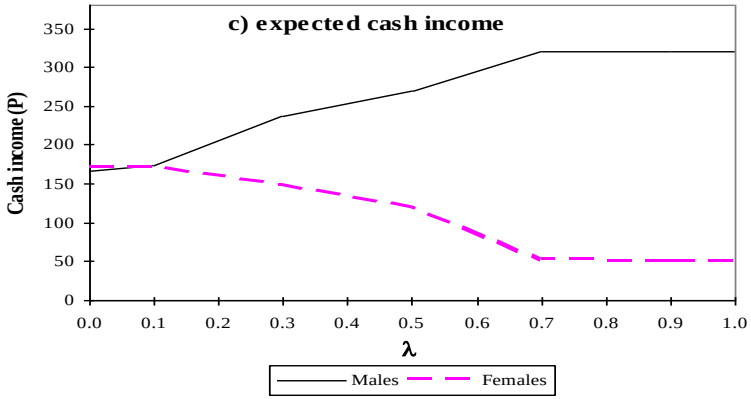
4.3 Effects of wage rate

The final experiment in relation to the labour market involved varying wage rate from a low level of ₱0.50/h to a high of ₱16/h. The off-farm work suggested in the optimal solution of the base model is already at the maximum allowed for males and more than 50 per cent of the level allowed for females. Consequently the upper bounds for off-farm work in this experiment were removed to allow examination of the variations of wage rate. The costs for labour hired in were also simultaneously varied with changes in wage rates. The results of the experiment are shown in Figure 4.

Figure 3: Effects of variation in lambda on off-farm work, cropped area, CE expected household utility, CE expected cash income and leisure time







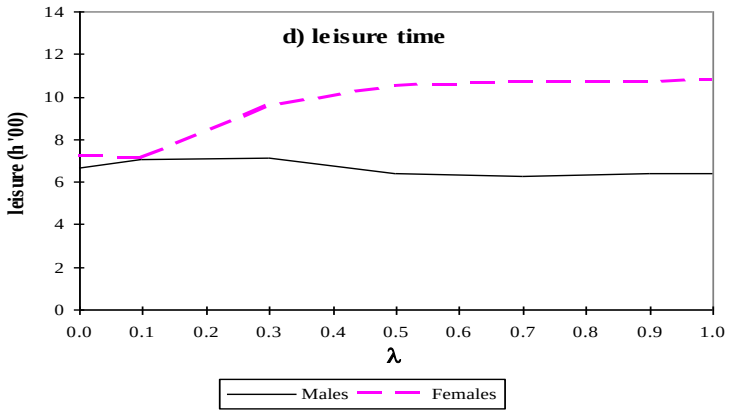
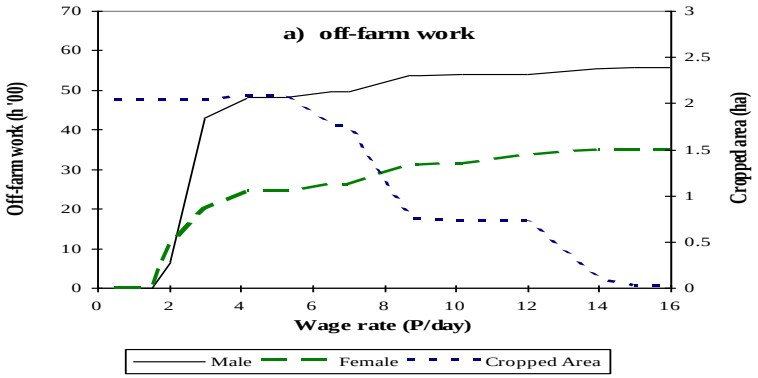
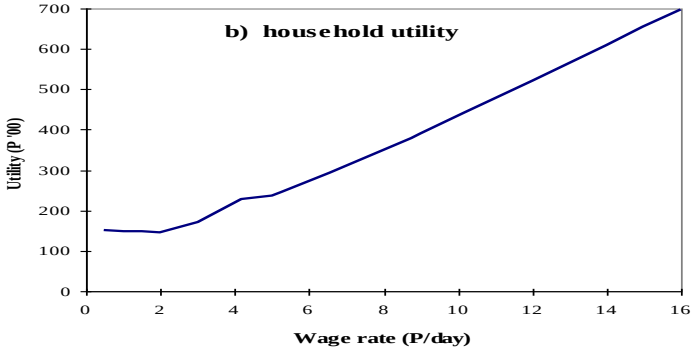
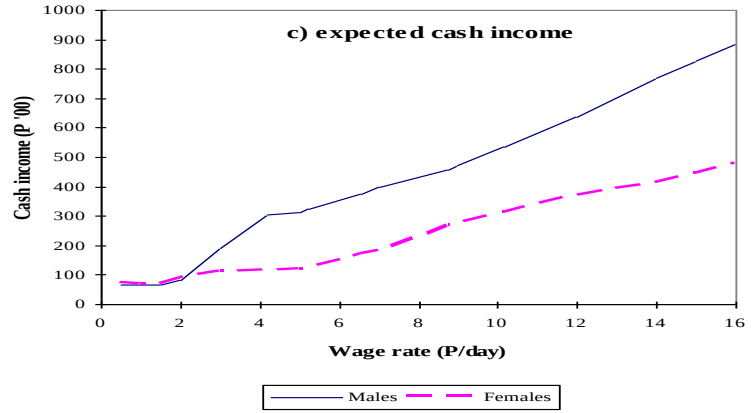
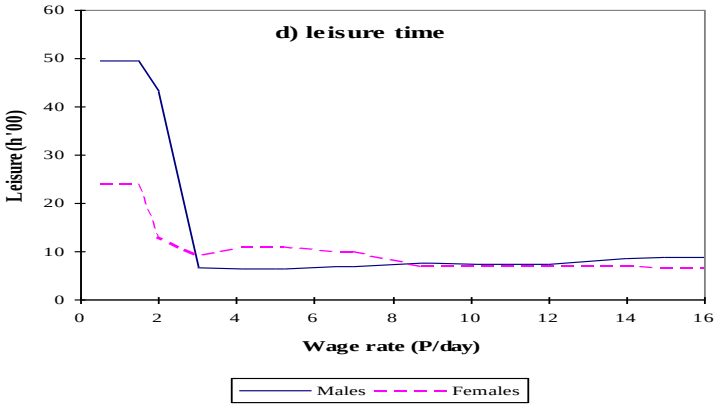


Figure 4: Effects of wage rate on off-farm work, cropped area, CE expected household utility, CE expected cash income and leisure time









When wage rate is equal to ₱0.50/h to ₱1.50/h, both males and females do not undertake off-farm work. There is a large increase in the off-farm work of males between wage rate levels ₱1.50/h and ₱3/h, after which the rate of increase gradually slows down. For females, there is also a substantial increase in off-farm work between wage rate levels ₱1.5/h and ₱4/h. Thereafter, the increase becomes more gradual. The area devoted to crops initially remains constant at 2.045 ha between wage levels of ₱0.5/h to ₱2/h then gradually declines to 2.085 ha, at wage rate levels equal to ₱4/h to about ₱5.5/h. After this level, the decline in cropped area becomes faster up to about 0.752 ha when wage rate equals ₱8.5/h. From this level, most of the crops produced are for household subsistence. Between ₱12/h and ₱15/h, the area cropped again experiences a sudden dip, and thereafter levels off. The number of swine remains the same (1 head) when wage rate is about ₱0.5/h to about ₱10/h. After this wage rate level, swine disappears from the optimal solution. Goat only appears when wage rate is equal to ₱0.5/h to ₱2/h, while poultry appears from ₱0.5/h to ₱3/h.

As expected, the model results show that when wage rates are extremely low (*i.e.*, ₱0.50 to ₱1.50 per hour), it is more profitable for the farm household to undertake farm activities. It does not pay for household members to work outside the farm, so no off-farm work is undertaken at all and the remaining time is instead used for leisure. At about ₱3 per hour, the wage rate level is high enough to induce household members to allocate some of their time to outside work. At this point, the cropped area is not affected much because the household uses some of its slack time to the off-farm activity, causing a decrease in the leisure time of males and females alike, but barely affecting the time spent on farm work. From about ₱5.5 wage rate, the area cropped decreases as the farm household starts to trade farm work with off-farm work. This implies that at higher wage rates, off-farm employment may start to compete with farm work for the representative farm household, provided that off-farm employment is available.

Both the household utility and the expected cash incomes are positively affected by wage rates. The effect on the expected cash income of males is greater than that for females, particularly towards the upper end of the graph, when wage rate levels are higher (between ₱12 and ₱16/h).

The effect on the leisure time of males and females can be seen in the last diagram of Figure 4. Between wage rate levels ₱0.5/h and ₱2/h, the leisure times of males and females remain fairly constant. After the ₱2/h level, a dramatic decline in leisure time ensues as the household trades off leisure for work (and therefore more cash income). The decline in leisure time continues up to about ₱5.5/h for males whereupon leisure time increases but only by small amounts. For females, leisure time decreases throughout the range of wage rates included in the experiment, although the decrease is only slight from about ₱8/h to ₱16/h.

5. Conclusions and Policy Implications

The model was used to examine the effects of off-farm employment and wage rate on the income of farm households. The results of the policy experiments showed that increased availability of off-farm work has virtually no effect on the crop growing activities but is associated with increased off-farm work and the expected cash incomes of household members as well as the utility of the entire household. The impact of wage rate increase is also positive on the expected cash incomes of males and females and on household utility. Therefore areas which are predominantly labour surplus regions would likely benefit from employment generation schemes such as public employment schemes and/ or developing rural-based labour-intensive industries that would help absorb the rapid expansion of the labour force. Strategies that promote agricultural development via labour-intensive methods would likely be beneficial as the multiplier effect of farm income growth would stimulate labour-intensive, capital economising rural industries such as service industries, carpentry, building, transport, thereby easing the unemployment level in the country.

In general, however, increasing wage rates has an inverse effect on the area cropped and the level of animal husbandry, indicating a movement away from on-farm production to off-farm activities. Because rising wage rates for off-farm work means a corresponding increase in the cost of hired labour, the impact of such dual changes would likely be different for farms of different size. Higher wage rates would likely benefit small farms the operators of which are likely to be net sellers of labour, but would harm the operators of larger farms who are net hirers of labour.

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