“Non-Farm Rural Activities (NFRA) in a Peasant Economy: The Case of the North Peruvian Sierra”

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Abstract

Is it feasible to increase income and generate employment in the context of a traditional labour intensive rural industry with strong linkages to an agriculturally backward economy? In order to address this issue, primary data from four villages of Peruvian North Sierra was used. The case of the hat making activity, employing exclusively family labour, purchasing the main input (straw, *paja de palma*) from Ecuador, and with consumers concentrated on villages and small towns, was investigated. The analysis was made at the market level. Considering the context of a self-employment activity, a theoretical framework was developed to explain the determinants of labour demand, input demand, hat output and labour return. Demand and supply constraints to the expansion of hat making activity were found. Important differences in the value of labour marginal product across the sample were identified. These were mainly associated with the use of varied input quality. Growth based on local demand would not be viable given falls in consumer incomes - mainly farmers - and expected changes in consumer preferences; therefore the growth motor would rest more in market expansion and product diversification to urban consumers.

JEL Classification: D12, D21, Q12.

Key words: Non-farm rural activities, self-employment activity, peasant economy, Peru

1. Introduction

Hymer and Resnick (1969) developed the first model of an agrarian economy with non-agricultural activities, in which the rural industry includes activities of households and small workshops. The activities in this model are characterised by the use of traditional production methods, and the output of low-quality commodities is consumed locally (Z-goods). The authors expected that rural industry would disappear as the process of modernisation proceeds. Therefore, this has led to neglect of the importance of non-farm rural activities as part of household income strategy. However, with reference to the successful rural industrialisation in East Asia (Japan and Taiwan), Ranis and Stewart (1993) introduced the concept of modern Z-goods. These are produced by modern production methods and face high demand from urban and overseas markets.

The promotion of non-farm rural activities (NFRA) is thought to have an important role in employment creation. This strategy aims to reduce rural poverty (Saith, 1987, 1991). NFRA are forms of employment, income and livelihoods not directly derived from crop and livestock production. From a Latin American perspective, according to case studies, it is estimated that non-farm income and employment accounts for 40 percent and 25 percent of the rural totals, respectively (Reardon, et.al.:1998). In Peru, the share of non-farm rural income is even higher, 50 percent (Escobal, 2001).

The relationship between promotion of NFRA and poverty reduction is attracting the attention of international institutions and academics. However the main drawbacks of most current studies are that they are descriptive and lack a theoretical framework for analysing the role of NFRA within a household income strategy. Therefore, more case studies are needed to understand what are the necessary and sufficient conditions for NFRA succeed in the context of a backward rural region.

The ultimate objective of this paper is to explore the feasibility of policies that promote NFRA successfully in rural Peru, by identifying the constraints on, and opportunities for, one major source of NFRA, namely hat-making. Hat production is an important activity in a number of villages in Bambamarca, a remote region with high incidence of poverty in the North Peruvian Sierra. This is the case of a traditional rural industry whose earliest historical references are since Colonial period in XVIII century.

In order to deal with the paper subject, theoretical and empirical approaches were made at the handicraft market level. Therefore, demand and supply analyses were undertaking.

The paper has four further main sections. The next section presents a description of the research area. The third section develops the analytical framework at the market level. The fourth section summarizes the empirical findings at the demand and supply levels. The last section offers conclusions.

2. Survey methodology and characteristics of hat making activity

This study employs household level data and handicraft market data collected for the author in the province of Bambamarca, located in the North Peruvian Sierra where 80 percent of the population is rural and is organized in peasant family units. A sample of four villages and 208 households was selected in 2000 according to the following criteria:

1. Two villages with marginal non-farm rural activities: Pusoc and Tallamac. So, crop and livestock production should be significant in terms of family income and labour allocation, contributing 89 percent and 93 percent of total net family income, respectively. Those villages are hat consumers and the participation of hat expenditure in total family expenditure was 8.8 percent for the crop year 1999/2000.

2. Two villages with important non-farm rural activities, in particular hat production: El Frutillo and Marco Laguna, contributing 86 percent and 82 percent of total net family income, respectively. Hat manufacture requires labour, supplied exclusively from household members, and a type of straw known as *paja de palma* bought in Ecuador and sold in Bambamarca shops by a small number of input traders.

Every Sunday there is an open hat market in Bambamarca. It is the meeting point of hat producers, local consumers and hat traders. These traders supply hats to rural Coast and rural Sierra towns. Only 15 percent of the traders control about 83 percent of hat trading, allowing them to collude and fix the producer prices. In the next section a model that describes the hat making activity is developed.

3 Market model: The case of hat making activity

A partial equilibrium model encompassing hat production, hat trade and final consumption is developed. Given a context of a self-employment activity, the model explains the determination of hat output at market and producer levels, input demand, labour demand and labour return.

The peasant family produces a hat, q_h, using straw from Ecuador (*paja de palma*, I), and family labour, L, with output given by a Leontief production function, $q_h = Min\{L/a, I/b\}$, where "a" and "b" are the labour and input technical coefficients, respectively. In order to simplify the analysis, it is assumed that labour, straw and hats are homogeneous; this means that there are no quality differences in factor use and output[1].

There is no credit market for hat making, so family revenue is the only source of input acquisition. The hat traders fix the hat price, P_h^p, at the hat maker level. The total cost of production, TC, given by the straw cost and the imputed value to family labour is equal to the total hat maker revenue (R). P_i is the straw price and "w" is the labour return per hour (equation 1).

$$R = P_h^{\,p} q_h = TC = P_i I + wL \qquad (1)$$

The supply at the hat maker level is defined by equation 2, which is obtained by substituting the optimal levels of labour and input, resulting from the production function, in equation (1).

$$MR = MC = P_h^p = bP_i + aw \quad \text{for} \quad q_h \le q_h^* \qquad (2)$$

Marginal revenue (MR) and marginal total cost (MC) are equalised to the hat maker price level, assuming that current level of hat product is less than full employment production, q_h^*, production reached when total family labour is used in hat making. There is a constraint to the level of imputed labour value, w. The situation in which $w \le 0$ is not a feasible one. So, in order for hat making to be a viable activity, the level of labour return must guarantee a minimum access to food items.

In relation to the straw market, equation 3 describes the input price function, P_i.

$$P_i = P^* e(1+\lambda_1) \qquad (3)$$

The input is a tradable commodity imported from Ecuador. The price depends on border input price in US dollars, P*, the nominal exchange rate, e, and the trader marketing margin, λ_1. The input demand is defined directly by the level of hat output, $I^d = bq_h$.

Family labour is allocated exclusively to hat making. Given a total family labour supply, $L^s \ge L^d$, it is expected that most of family members will be involved in this activity following the requirements of the labour demand function, $L^d = aq_h$.

[1] This assumption, related to the final output, is relaxed in the empirical analysis when considerations on hat quality are taking into account.

Equation 4 expresses the determinants of labour return. It is affected negatively by changes in input price components, and positively by hat price, assuming technological parameters fixed.

$$w = \frac{P_h{}^p - [P * e(1+\lambda_1)]b}{a} \qquad (4)$$

The hat-trading component is summarised as $P_h{}^t = P_h{}^p(1+\lambda_2)$. The price at the hat demand level, $P_h{}^t$, depends on the price paid to the hat maker and the marketing margin, λ_2.

In order to simplify the theoretical model, a Cobb-Douglas demand function was assumed[2]. Hat demand in the short run, given family characteristics, consumer tastes and preferences, A, depends on income of consumers from Coast and Sierra towns and small cities, M, hat price, $P_h{}^t$, food prices, P_f, and non-food prices, P_{nf}, (equation 5).

$$Q = A P_h{}^{t\,\alpha 1} P_f{}^{\alpha 2} P_{nf}{}^{\alpha 3} M^{\beta} \qquad (5)$$

The Cobb-Douglas demand function displays constant income and price elasticities, given by the respective parameters of the demand function. According to the law of demand, $\alpha_1 < 0$. It is assumed that hats and food goods are substitutes goods, $\alpha_2 < 0$, while hats and non-food goods are complements, $\alpha_3 > 0$, and the hats are normal goods, with $\beta > 0$.

In defining market equilibrium, a market supply was characterized in equation 6.

$$P_h{}^t = P_h{}^p (1+\lambda_2) \ \ for \quad Q \leq n q_h^* \qquad (6)$$

Assuming "n" identical household hat makers, the total level of hat output at the market level is Q, with a level of hat maker household production given by q_h, $q_h = Q/n$. Replacing the demand function in q_h, it is possible to identify the determinants of hat output at the household level (eq. 7), as well as labour demand (eq. 8) and input demand (eq. 9).

$$q_h = \frac{1}{n} A P_h{}^{t\,\alpha 1} P_f{}^{\alpha 2} P_{nf}{}^{\alpha 3} M^{\beta} \qquad (7)$$

$$L^d = \frac{a}{n} A P_h{}^{t\,\alpha 1} P_f{}^{\alpha 2} P_{nf}{}^{\alpha 3} M^{\beta} \qquad (8)$$

$$I^d = \frac{b}{n} A P_h{}^{t\,\alpha 1} P_f{}^{\alpha 2} P_{nf}{}^{\alpha 3} M^{\beta} \qquad (9)$$

When comparing the labour return given by equation (4) with the subsistence wage, w^s, the following shutdown condition[3] is derived:

$$\begin{cases} If \quad w(P_h^p, P_i) \geq w^s, therefore \quad Q > 0 \\ If \quad w(P_h^p, P_i) < w^s, therefore \quad Q = 0 \end{cases}$$

If labour return is equal or greater than the subsistence wage, the household would decide produce hats, with Q > 0. Otherwise, if labour return is lower than the subsistence wage, household would produce nothing, with Q = 0.

[2] Note that in the empirical analysis an AIDS model, which allows regularity properties to be tested, was estimated.
[3] This is an adaptation from a competitive firm case (Varian, 2003).

The endogenous variables in the model are market output, Q, household output, q_h, labour demand, L^d, straw demand, I^d and labour return, w. The exogenous variables are the straw price in local currency, P_i, international input price, P*, nominal exchange rate, e, input trader marketing margin, λ_1, retail hat price, P_h^t, hat producer price, P_h^p, hat trader marketing margin, λ_2, consumer income, M, food price goods, P_f, non-food price goods, P_{nf}, tastes and consumer preferences, A.

The endogenous variables[4], as described in (4), (5) and (7)-(9) equations, can be written in their reduced forms as follows:

Market Output $Q = f_1(P_h{}^p, \lambda_2, M, A, P_f, P_{nf})$

Household hat maker output $q_h = f_2(P_h{}^p, \lambda_2, M, A, P_f, P_{nf})$

Labour demand $L^d = f_3(P_h{}^p, \lambda_2, M, A, P_f, P_{nf})$ (10)

Input demand $I^d = f_4(P_h{}^p, \lambda_2, M, A, P_f, P_{nf})$

Labour return $w = f_5(P_h{}^p, P^*, e, \lambda_1)$

A static comparative analysis based on this model, equation (10), allows knowing impacts on output, labour return, labour demand and input demand when changes in supply and demand parameters are taking into account. For instance, an increase in income consumer, $\Delta M > 0$, has a positive effect on market output, household output, labour demand, input demand, but labour return remains unchanged. Similar results are obtained when changes in consumer tastes[5], $\Delta A > 0$, are considered. Conclusions derived from this model will be discussed in the next section.

4. Expansion constraint to a traditional rural industry: Empirical evidence

This section focuses on the empirical analysis of hat demand and hat supply.

4.1 The hat demand analysis

4.1.1 Participation in hat demand

This section presents a probit model estimating the probability that a household in rural Bambamarca will participate in the hat maker as a consumer. The results of the probit analysis, including parameter estimates, corresponding t-statistics, level of significance and marginal effects, are given in Table 1. In the appendix, Table A.1 provides the definitions, sample means and standard deviations of selected variables for the whole sample and the sub-samples of households that purchased hats (consumers) and those households that did not (non-consumers).

[4] The prices functions for straw and hat at the trader level are definitional equations, this is, they set up an identity between two alternative expressions that have the exactly the same meaning. On the other hand, the five set of equations in (10) are behavioural equations (Chiang, 1988).

[5] The parameters of the consumer utility function are represented in the demand function (5) by coefficients A, α_1, α_2, α_3 and β. Changes in tastes could be reflected by changes in one or more of these coefficients. For simplicity, a change in tastes is assumed here be expressed as a change in the A coefficient.

Table 1 Probit Model of Household Participation as Hat Consumer in Rural Bambamarca, 1999-2000.

Dependent Variable: Hatdummy	Estimate	t-statistics	P>|t|*	Marginal Effect (*dx/dy*)
Lnexpcap	1.157	3.69	0.000	0.396
Child14	0.285	2.00	0.046	0.097
Man14-24	-0.216	-1.07	0.283	-0.074
Man25-64	0.327	0.62	0.536	0.112
Wom14-24	0.671	2.80	0.005	0.229
Wom25-64	0.358	1.17	0.240	0.122
Elderly	0.618	1.89	0.059	0.212
Highschool	-0.759	-2.10	0.035	-0.283**
Nearcity	0.322	1.08	0.278	0.110**
Constant	-7.938	-3.48	0.000	
Goodness of fit				
Log-likelihood: -53.130				
Wald Chi^2 (9) :24.52				
Significance level: 0.0036				
McFadden R^2 : 0.19				
Pseudo R^2 : 0.195				
% of correct[1] predictions : 0.74				
% of correct predictions of ‘ones’: 0.89				
% of correct predictions of ‘zeros’: 0.44				
Number of observations: 104				

Note: t-statistics are based on a White (1982) robust covariance matrix.
[*]The t statistic is the ratio of the coefficient to the standard error. P>|t| is the significance of the coefficient.
[**]*dy/dx* is for discrete change of dummy variable from 0 to 1.
(1) An observation is predicted to be 1 if the predicted probability is 0.5 or larger, otherwise the observation is predicted to be zero.

The value of the likelihood ratio test statistics was larger than the 5 percent value for χ^2 distribution with 9 degrees of freedom. So, the null joint hypothesis that all slopes in the regression equation were zero was rejected. A measure indicating the goodness of fit of the probit model is the percentage of observations that are correctly predicted by the model (Greene, 2000). The percentage of correct predictions is 74 percent. Alternatively, other measures can be estimated based on the likelihood values. Among these, McFadden R^2 and Pseudo R^2 are 0.19 and 0.195, respectively[6]. These results are reasonable since that goodness of fit is fairly low for discrete choice model (Verbeek, 2000).

[6] Both goodness-of-fit measures are defined as follows (Verbeek, 2000):

$$McFaddenR^2 = 1 - LogL_1 / LogL_0,$$

$$PseudoR^2 = 1 - \frac{1}{1 + 2(LogL_1 - LogL_0)/N},$$

where N denotes the number of observations, $LogL_1$ is the maximum likelihood value of the model of interest and LogLo is the maximum value of likelihood function when all parameters, except the intercept, are set to zero.

The results suggest that family composition has an influence on participation. In particular, households with children younger than 14 years old, females aged 15-64 years, males aged 25-64 years and the elderly over 65 years have a higher probability of participating as hat consumers. A positive, significant relationship was also found between annual per capita family expenditure and participation. However, a household head with over 7 years of high school education has a significantly lower probability of participating as a hat consumer.

The marginal effects, computed at the sample means for the continuous variables, are also shown in Table 1. The estimates indicate that a one-point increment in log of expenditure per capita increases the probability of buying a hat by 39.6 percent; every additional child aged below 14 years increases the probability by 9.7 percent. Similar effects are found for men aged 25-60 years, women aged 14-25 years, women aged 25-64 years and elderly. In those cases the probability of participating as hat consumers increases by 11.2 percent, 22.9 percent, 12.2 percent and 21.2 percent, respectively. On the contrary, an additional male aged 14-24 years reduces the probability by 7.4 percent. Those results reveal that family composition by age and gender is important in explaining household hat purchase.

Furthermore, if a household is located near Bambamarca town the probability increases by 11 percent. This result seems to suggest that when households are more geographically isolated, ceteris paribus, they have lower participation in the hat market.

In households in which the heads have more than 7 years of schooling, those who have reached any high-school graduation, the probability of buying a hat is lower by 28.3 percent. This indicates that education decreases the likelihood of participation. Apparently, more educated parents are less interested in using a straw hat, which is considered an external symbol of being a peasant. Assimilation to urban patterns of consumption and changes in perceptions and consumer preferences through the educational system could explain this behaviour. It will be important to take this finding into account when the long-term prospects of hat demand are discussed later.

4.1.2 Estimation of system of demand equations

At the empirical level, the demand approach allows the estimation of a hat expenditure equation and the calculation of the associated income elasticities in relation to hat expenditure and price elasticities, and to identify the effect of household characteristics (family size and household's head years of education). An almost ideal demand system (AIDS, Deaton and Muellbauer, 1980) was estimated to investigate household hat demand in Bambamarca. The system was estimated using a set of 6 budget share equations. The commodities were rice, sugar, oil, detergent, kerosene and hats.

The standard econometric specification of the AIDS model for each of the budget share equations is:

$$w_i = \alpha_i + \sum_{j=1}^{6} \gamma_{ij} \log p_j + \beta_i \log\left(\frac{M}{P}\right) + \sum_{K=1}^{2} \delta_k X_k + \varepsilon_i \qquad (11)$$

where

w_i	= Budget share for each commodity
M	= Total expenditure
P	= Stones's index estimated as log P = $\Sigma w_i \log P_i$
p_j	= Price of each commodity
j	= 1, rice
	= 2, sugar

= 3, oil
= 4, detergent
= 5, kerosene
= 6, hat
X_k = Family characteristics
k = 1, family size
= 2, household head years of education
ε_i = Error term
$\alpha_i, \gamma_{ij}, \beta_i$ and δ_k are parameters to be estimated.

The model was estimated by FIML, which obtains full information likelihood estimates for a non-linear simultaneous equation model. The data set used in this estimation comprises cross section observations on 70 families from rural Bambamarca. Table A.2 (see appendix) presents some summary of the household sample. The rather large standard deviation of the principal variables is noted.

In defining the selected preferred specification, alternative models were evaluated. Firstly, the restricted model without family characteristics was compared with the unrestricted model with family characteristics. Based on likelihood ratio and χ^2 at 5 percent level of significance, the latter model was accepted. The next stage was to impose symmetry; later, symmetry with homogeneity was tested. Both restrictions were accepted, so the final specification of the preferred model was a restricted model with symmetry, homogeneity and family characteristics. Following Bewley's method (1986), the goodness of fit of the estimated demand system, $R^2_{L,}$ was 0.22. Based on the selected model parameter estimates, the own, cross-price and expenditure elasticities were computed. The results are presented in Table 2.

Table 2 Matrix of estimated price and expenditure elasticities (Evaluated at sample means)

Commodity	Rice	Sugar	Oil	Price of Detergent	Kerosene	Hats	Expenditure
Rice	**-0.95**	-0.27	0.07	-0.01	-0.06	-0.21	1.43
Sugar	-0.27	**-0.44**	0.25	0.19	-0.17	0.04	0.40
Oil	0.38	0.17	**-1.00**	-0.18	0.13	-0.26	0.75
Detergent	0.27	0.32	-0.32	**-0.64**	-0.08	-0.06	0.51
Kerosene	0.07	-0.31	0.33	-0.08	**-0.38**	-0.07	0.43
Hat	-0.36	-0.11	-0.33	-0.10	-0.10	**-0.36**	1.37

All own-price elasticities estimates had correct negative signs. All own-price elasticities, except oil, are inelastic. All estimated food expenditure elasticities are positive; rice and hats are luxury goods, whilst sugar, oil, detergent and kerosene are necessity goods.

Relating the findings of the empirical analysis with the outcomes of the market model presented in section 3, it can be concluded that: 1) Hats are luxury goods with a price inelastic demand. 2) There is a relationship of complementary among hats, rice, oil, detergent and kerosene.

Does the hat making activity in Bambamarca face a demand constraint? In dealing with this question, the following approach should be considered: a) Assuming that tastes and consumer preferences are fixed, changes in the level of hat demand arise from changes in the real income or changes in its relative prices. Empirical evidence about the trend in hat consumer's income reveals that for Tallamac village, when monetary annual family incomes in real terms are compared between 1993/1994 and 1999/2000 crop years, a average annual growth rate of –8 percent was estimated. Using data from Living Standard Measurement

Studies Household Survey (ENNIV in Spanish) it was estimated that between 1994-2000, the average annual growth rate of household expenditure for rural Sierra and rural Coast households was -2.53 percent and –3.4 percent, respectively. This means that falls in consumer real income, ceteris paribus, would have affected negatively hat demand.
b) Considering changes in the tastes and consumer behaviour of the rural population in the face of access to education and increasing urban experience could be bringing about a decline trend in hat demand. Information from National Census and Household National surveys shows an increasing access to primary and high school education in rural areas. One result of the probit model mentioned above was that the household participating in hat market as consumer exhibited a significantly inverse relationship between access to high education of household head and the probability of participation. This fact provides reasons to believe that changes in peasant family preferences and tastes would be expressed in a declining interest in using straw hats.

Therefore, in order to answer if there is a demand constraint in the hat making activity, the information analysed seems to suggest that a declining trend in the rural demand for hat is the more likely outcome given falling farmer incomes and expected changes in consumer preferences. At this point of the argument, the link between hat making activity and the farm economy is identified as a key aspect in the demand side static analysis. This means that hat consumers are farmers from villages and small towns from Sierra and Coast regions. The growth in farm incomes provides an expanding market for hats produced by the traditional rural industry. So, a strong direct relationship could be outlined between farm incomes and non-farm incomes in this particular context. Therefore, a rapidly growing agriculture sector offers, given demand patterns, a stimulus for higher rural non-farm incomes. Clearly, the opposite picture emerges when agriculture is stagnant[7]. In such circumstances, consumers opt for reducing their demand for hats or deciding to buy low quality hats. This latter decision, in particular, has important consequences on the labour return of the hat makers and, therefore, in their living conditions. This issue will be discussed in the next section.

4.2 The hat supply analysis

4.2.1 Participation in hat making activity

Another probit model was estimated to explain the household decision to engage in hat making. Table A.3 contains the variable description and descriptive statistics of selected variables for the full household sample and sub-samples of households participating as hat makers and those that are not. The full sample comprises 208 households and 104 households form each household.

The probit model results are reported in Table 3. The model predicts 81 percent of the observations correctly. It also predicts correctly 86 percent of the households that participated in hat making did so and 77 percent who did not participate would not. McFadden's R^2 and Pseudo R^2 have values of 0.35 and 0.49, respectively. Therefore, the model performance can be considered reasonably satisfactory in distinguishing between households that engage in hat making and households who do not.

[7] One indicator of stagnant agriculture in Tallamac is given for the comparison of potato yield. In 1995/1996 harvests the yields reached 5,208 kg/ha, whilst in 1999/2000 they were 3,597 kg/ha (Field work in Bambamarca 2000).

Table 3 Probit Model of Household Participation in Hat Making Activity Rural Bambamarca, 1999-2000.

Dependent Variable: Hattown	Estimate	t-statistics	P>|t|*	Marginal Effect (*dx/dy*)
Landsize	-0.065	-1.06	0.288	-0.026
Cattle	-0.044	-2.12	0.034	-0.018
Ferpestirri	-0.709	-2.07	0.038	-0.265**
Ratio	0.657	3.43	0.001	0.261
Labour	0.343	3.65	0.000	0.137
Headage	-0.002	-0.21	0.837	-0.001
Headsex	0.173	0.34	0.732	0.068**
Headedu	0.024	0.55	0.579	0.009
Famedu	0.043	0.56	0.575	0.017
Migrant	-0.964	-2.56	0.010	-0.337**
Credit	-0.033	-0.08	0.939	-0.013**
Comwork	-0.340	-1.62	0.105	-0.135**

Goodness of fit
Log-likelihood: -93.16
Wald Chi^2 (12) : 53.70
Significance level: 0.00
McFadden R^2 : 0.35
Pseudo R^2 : 0.49
% of correct[1] predictions : 0.81
% of correct predictions of 'ones': 0.86
% of correct predictions of 'zeros': 0.77
Number of observations: 208

Note: t-statistics are based on a White (1982) robust covariance matrix.
*The t statistic is the ratio of the coefficient to the standard error. P>|t| is the significance of the coefficient.
***dy/dx* is for discrete change of dummy variable from 0 to 1.
1.An observation is predicted to be 1 if the predicted probability is 0.5 or larger; otherwise the observation is predicted to be zero.

These results show that cattle stock, access to irrigation water, use of fertilizer and pest control management, the family dependence ratio, the number of working household members, households with temporary labour migration to regional markets, have statistically significant effects on the household participation in hat making activity. However, variables related to human capital – e.g. sex, age and education of the household head, average household years of formal education – and others as access to credit and arable land owned size are statistically insignificant or only marginally significant.

Marginal effect estimates suggest that an additional unit of cattle stock lowers the probability of making hat by 1.8 percent. A household using irrigation water, fertilizer and pesticide has a lower probability by 26.5 percent of being a hat maker. This result implies that potato production, the main cash crop in the region, greatly influences the pattern of household diversification.

A household is less likely to be engaged in hat making if a member takes part in regional labour markets. In this case the probability is lowered by 33.7 percent. Income opportunities outside local towns and the involvement with other regional territories are more attractive than hat making activity as source of income.

Family composition variables seem to have a positive effect in defining participation. Family dependency ratio and the number of household working members are positive and statistically significant variables in explaining hat-making participation. A one-point increase in the family dependence ratio increases the probability by 26.1 percent. Moreover, one additional member in the family labour force increases the probability of participation by 13.7 percent. From the previous results it can be concluded that larger families facing limited off-farm job opportunities and with restricted access to farm inputs and cattle stock are more likely to be involved in hat making activity. Apparently, human capital variables, as gender, age, education of household head and average household years of education, are not relevant in explaining participation due to the narrow variability between the two samples.

The size of the arable land owned has a negative effect on participation but it is not statistically significant. This means that access to land per se is not a guarantee that households will be engaged to a great extent in farm activities. Crop pattern, that is, the allocation of land between cash and food crops, land quality, geographical conditions and access to farm inputs appear to be key factors in explaining the limited impact of land size in rural Bambamarca (Velazco, 1998).

4.2.2 Analysis of labour return

Hat making is a labour intensive activity. Depending on its quality, it may take two to eight weeks to produce a hat. The sale of hats is a key mechanism for the money income of peasants who have limited or no surplus farm production. This means, the higher is the family self-consumption as a share of the total agricultural and livestock production, the greater their need to generate income sources by manufacturing and selling hats. For these households, this activity is performed almost the whole year, requiring excessive work hours from family members.

Table 3 shows a hat price decomposition analysis based on the input-output technology assumed in the market model in section 3.

Table 3 Components of Hat Price According to Quality and Town (Monetary values in Peruvian New Soles)

Quality	Hat Maker No.	Hat Price P_h^p	Hat* Margin λ_2 (%)	Input price *Pi*	Input* Margin λ_1 (%)	Total hours per hat, *a*	Labour return per hour, *w*
Total sample	259	105.5		22.3		151.9	0.52
		(62)		(5.8)		(40)	(0.24)
Low Quality							
All sample	221	87.15	55	21.2	40	144.9	0.46
		(27.9)		(5.4)		(36.8)	(0.15)
High Quality							
All sample	38	214.6	65	28.5	55	193	0.87
		(92)		(4.4)		(32.9)	(0.34)

Source: Survey conducted by author in Bambamarca, Peru, 2000.
Note: The hat price is determined by the following formula: $P_h^p = bPi + aw$. Where "b" is the input requirement per hat, so b=1 kg for any type of hat. Standard deviations are in parentheses.
*λ_2 and λ_1 are the marketing margin for hat traders and straw traders, respectively.

It is important to highlight that labour return variable, w, is equivalent to the value of labour marginal product. The analysis of labour return according to hat qualities reveals:

1) Considering a total sample of 259 hat makers, about 85 percent are engaged in the manufacture of low quality hat. Important differences in the level of labour return according to hat qualities are identified.
2) A raw differential of 0.278 log-points (32 percent) in favour of high quality hats was estimated. In order to know if individual characteristics are important in explaining such differences, an Oaxaca (1973) decomposition of labour return differential was computed. Results indicate that only about (0.027, 0.0599) log-points are due to differences in education of hat maker and distance of the household to the main market centre. The rest is explained by the hat quality differential. So, it can be concluded that the type of input used in hat making matters in defining the value of labour productivity.
3) In comparing the labour return with two alternative wages rate per hour, the farm wage at the local village (S/. 0.625 per hour) and a proxy of the subsistence wage based on the extreme poverty line for rural areas in Peruvian Sierra (S/. 0.47 per hour), it was found that: i) in the sample, labour return per hour is higher than the subsistence level wage; ii) a different scenario emerged when labour return was considered according to hat quality. Low quality hat makers were receiving a labour return closer to the subsistence wage rate. In contrast, in the case of high quality hat makers, their labour return is 85 percent higher than the subsistence wage. This suggests that using low quality input and, therefore, making low quality hats is directly associated with low value of labour productivity.

In general, based on the previous analysis, the following relationship among previous wage rates per hour is identified:

$$w_{high} > w_{farm} > w_{low} \cong w_{sub} \qquad (12)$$

where:

w_{high}	=	Labour return per hour of high-quality hat maker
w_{farm}	=	Farm wage per hour in local village
w_{low}	=	Labour return per hour of low-quality hat maker
w_{sub}	=	Subsistence wage rate per hour for Peruvian Sierra

These relationships recall to the shut down condition discussed in section 3. This result provides evidence that the low-quality hat makers would be approaching to this condition since hat making hardly provides the minimum requirements for household maintenance.

El Frutillo and Marco Laguna villages are engaged in traditional rural industry that contributes to the family income and takes significant time of the household members. The favourable scenario would be that a hat maker has access to high quality input. Therefore, the underlying issue is how to transform Z-goods - following the terminology of Resnick - of low quality goods into modern goods with steady demand in regional and national markets. Restrictions on the supply side hindering this transformation would be related to: 1) the lack of access to credit for the timely purchase of better quality straw. From the survey questionnaire was possible to identify some evidence on the access to credit. During 1999/2000, only one household had access to credit offered by a local NGO (Non-Governmental Organization). As it can be noted, for the vast majority of the hat producers, hat revenue is the only source for purchasing input. Given this context, the most important producer's expectation about improvement in hat making is related to the access to credit in order to buy a better quality input. Underlying this fact is the strong relationship between access to a better quality input and a higher labour return. 2) The presence of few hat traders who collude to fix the price at the producer level. This fact means that an increase in input cost is not reflected in a higher producer price, in contrast it is expressed in a fall in labour return.

5. Conclusions

Is it feasible to increase income and generate employment in the context of a traditional labour intensive rural industry with strong linkages to an agriculturally backward economy? From the results discussed, it can be noted that hat-making activity contributes to the family income and it is a labour intensive activity. In this case, the essential problem is how to transform the handicrafts produced from low quality goods into goods with a stable demand in the regional and national market; that is to transform from ordinary Z-goods into modern goods. The research findings suggests that the restrictions that prevent this transformation are: a) at the supply level, the access to credit sources in order to make timely purchases of high quality input and the limited development of an efficient hat trading system. b) At the demand level, it is known that the demand for handicraft is restricted to rural households from Coast and Sierra regions, which depends on income and family characteristics. An eventual expansion of NFRA based exclusively on local demand would not be viable given falls in consumer incomes and expected changes in consumer preferences; therefore, the growth motor would rest more in market expansion and in product diversification to urban consumers. The latter can be achieved through the expansion of tourism which will create enough stimulus for the supply of alternative straw products and that are more suitable to urban consumers' preferences. It is expected that if those limiting factors are overcome, handicrafts will stop being merely an activity that only allows a small amount of money to be earned quickly for subsistence and rather become an activity that generates an income stream and creates proper employment opportunities in the low income rural household context.

APPENDIX

Table A.1 Participation in Hat Demand in Rural Bambamarca, Peru: Descriptive Statistics

Variables	Variables Definitions	Full Sample		Consumers		Non-Consumers	
		Means	Std. Deviation	Means	Std. Deviation	Means	Std. Deviation
	Dependent Variables						
Hatexp	Annual Hat expenditure in Peruvian New Soles	121	130	177	122	0.00	
Hatdummy	Dummy variable. 1: if household bought hat	0.67	0.47	1.00	0.00	0.00	
	Independent Variables						
Lnexpcap	Ln of expenditure per capita	6.08	0.59	6.17	0.57	5.89	0.60
Child14	Number of children aged 0-14 years	1.31	1.15	1.31	1.19	1.31	1.06
Man14-24	Number of male aged 15-24 years	0.41	0.71	0.29	0.62	0.65	0.85
Man25-64	Number of male aged 25-64	0.85	0.46	0.86	0.48	0.82	0.44
Wom14-24	Number of female aged 15-24	0.50	0.64	0.54	0.66	0.42	0.58
Wom25-64	Number of female aged 25-64	0.95	0.73	0.97	0.76	0.87	0.64
Elderly	Number of adults over 65 years	0.28	0.59	0.28	0.59	0.16	0.42
Highschool	Dummy variable. 1: if head hh has more than 7 years of education	0.17	0.38	0.13	0.34	0.26	0.45
Nearcity	Dummy variables. 1: if hh is near Bambamarca city.	0.65	0.48	0.68	0.47	0.6	0.49
Sample Size		104		70		34	

Source: Survey conducted by author in Bambamarca, Peru, 2000

Table A.2 Descriptive statistics of budget shares of various commodity groups, their respective prices and family characteristics in the study area

Commodity group	Mean	Standard Deviation	Coefficient of variation (%)
Average budget share (%)			
Rice	33.92	7.89	23.26
Sugar	14.68	4.61	31.40
Oil	16.59	4.97	29.95
Detergent	8.19	2.38	29.05
Kerosene	8.02	3.72	46.38
Hat	18.60	7.72	41.50
Annual Expenditure (S/.)	2,161	960	44.4
Price /unit			
Rice (S/ 1 kg)	1.44	0.13	9.03
Sugar (S/ 1 kg)	1.65	0.10	6.06
Oil (S/ 1 litre)	3.68	0.38	10.33
Detergent (S/ 0.5 kg)	1.65	0.22	13.00
Kerosene (S/ 1 litre)	1.32	0.22	16.67
Hat (S/ unit)	123.93	43.59	35.17
Family characteristics			
Family size	4.41	1.77	40.14
Years education head of household	4.19	3.05	72.79

Table A.3 Household Participation in Hat Making Activity: Descriptive Statistics

Variables		Full Sample		Hat making towns		Farm towns	
		Means	Std. Deviation	Means	Std. Deviation	Means	Std. Deviation
	Dependent Variables						
Hattown	Dummy variable. 1: if household is engaged in hat making	0.5	0.5	1	0	0	0
	Independent Variables						
Landsize	Arable land owned in ha.	1.83	2.24	1.21	1.56	2.44	2.63
Cattle	Ovine equivalence of cattle stock	12.23	13.91	6.01	10.15	18.45	14.40
Ferpestirri	Dummy variable. 1 if hh. access to irrigation water, use of fertilizer and pest control last crop year	0.163	0.371	0.04	1.93	0.28	0.46
Ratio	Family dependency ratio	0.76	0.71	0.90	0.82	0.62	0.55
Labour	Number of working household members	3.17	1.64	3.55	1.77	2.81	1.42
Headage	Age of household head in years	44.78	13.84	43.86	11.7	45.71	15.67
Headsex	Dummy variable. 1: if head of hh is male.	0.96	0.20	0.94	0.23	0.97	0.17
Headedu	Years of education of household head	4.21	3.03	4.09	2.89	4.31	3.19
Famedu	Average household years of formal education (members > 15 years old)	3.11	1.48	3.12	1.38	3.09	1.57
Migrant	Dummy variable. 1 : if hh member migrated to regional markets	0.09	0.30	0.02	0.14	0.17	0.38
Credit	Dummy variable. 1 if hh has access to credit the last crop year	0.06	0.23	0.04	0.19	0.08	0.27
Comwork	Dummy variable. 1 if hh takes part in communal work	0.55	0.50	0.48	0.50	0.63	0.48
Sample Size		208		104		104	

Source: Survey conducted by author in Bambamarca, Peru, 2000

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