Earth Systems and Environment (2018) 2:621–632
https://doi.org/10.1007/s41748-018-0075-5

ORIGINAL ARTICLE

Understanding the Interdependence Between Worker Livelihoods and Decent Work at Certified and Non-Certified Mango Orchards in Pakistan

Muhammad Bilal Ahsan[1] · Mubashir Mehdi[1] · Burhan Ahmad[1] · Umar Sohaib Ahmad[1]

Received: 2 June 2018 / Accepted: 24 September 2018 / Published online: 15 October 2018

Abstract
There is little evidence of published literature regarding the incorporation of on-farm workers into global fresh produce value chains. Agriculture, a major sector in Pakistan, employs 50% of the total labor force, and contributes 21 and 30% to GDP and GNP, respectively. Two-thirds of the population resides in rural areas. Mango is the second major fruit product in the country. The horticulture industry of Pakistan in general, and the mango sector specifically, has been the focus of research and development efforts by governmental and various international developmental organizations. A participatory value chain approach has been adopted to enhance technological advancements and increase the competitiveness of farm enterprises. The adoption of best practices is slow due to a lack of attention to occupational health measures, lack of training and low wages among on-farm workers. Market incentives, compliance standardization and increasing demand for certified products has driven mango farms in Pakistan to seek certification by organizations such as GLOBALG.A.P., which has established provisions for decent work to focus on worker rights and safety. A sustainable livelihood for workers can be achieved by upgrading the value chain system through institutional reforms and an emerging philosophy of decent work put forth by the International Labour Organization. In this study, the effects of decency in the value chain on the income of on-farm workers were assessed at both GlobalG.A.P.-certified and non-certified orchards in Sindh and southern Punjab. Because of the food quality and safety standards required for certified orchards within the global value chain system, these compliant orchards offer greater potential for improving the livelihoods of on-farm workers. To overcome constraints, extensive awareness campaigns should be launched within the mango industry by institutional supportive bodies.

Keywords Decent work · Global value chains · Pakistan mango industry · Sustainable livelihood · GlobalG.A.P. compliance · On-farm workers

1 Introduction

Pakistan is an agriculture-based country of 190 million people. Fifty percent of the total labor force is directly engaged in agriculture; among these, half are women (Government of Pakistan 2016). Rural areas contribute more than two-thirds of the total. However, most of these rural populations are economically stressed and socially deprived in terms of low wages. Growers are the most common victims of seasonal and weather effects, price variations, and pest attacks, as well as demand and supply fluctuations in traditional value chain systems. The horticulture industry of Pakistan in general, and the mango sector specifically, has been the focus of research and development efforts by governmental and developmental organizations including the Australian Centre for International Agricultural Research (ACIAR), United Nations Industrial Development

✉ Muhammad Bilal Ahsan
Bilal.ahsan@uaf.edu.pk

Mubashir Mehdi
Mubashir_Mehdi@hotmail.com

Burhan Ahmad
Burhan_uaf@hotmail.com

Umar Sohaib Ahmad
rajaumarshakeel@yahoo.com

[1] Institute of Business Management Sciences, University of Agriculture, Faisalabad, Pakistan

Organization (UNIDO), Food and Agriculture Organization of the United Nations (FAO), International Centre for Development and Decent Work (ICDD) and the United States Agency for International Development (USAID). A participatory value chain development approach has been espoused to improve technological advancement and competitiveness among these farm enterprises. An advanced ACIAR "whole-of-chain" approach has been instrumental in transforming the value chain strategy in the context of on-farm industry development.

1.1 Problem Statement

"Waged on-farm agricultural workers" can be defined as men or women who are employed in the orchards, fields, livestock units, greenhouses and packhouses (i.e. processing facilities) at the farm level. They do not own or rent the land or the instruments they use (Adato and Meinzen-dick 2002; Hurst et al. 2005). They can be grouped into three main categories: permanent workers, seasonal workers and migrant workers (Ghani 2012). We can further categorize them as highly skilled or low-skilled workers based on their involvement in technical operations or ordinary work, respectively. They receive low wages and are considered a deprived class of rural Pakistan. On-farm workers account for 55% of total occupational injuries (Government of Pakistan 2016). They receive in-kind wages such as rice, wheat or other agricultural crops as an alternative to real wages for their services (Scherrer 2016; Ghani 2012). They are designated as a depressed class because of their complete dependence on landlords/owners and lack of ability to organize.

Consumers in the developed world are becoming increasingly conscious of both quality and working conditions at the point of production (Hurst et al. 2005; FAO 2015; Wognum et al. 2011). GlobalG.A.P., an international certification system aimed at ensuring good agricultural practice (GAP), and led by some of the top supermarket chains, has set out comprehensive compliance criteria for growers to meet the needs of this competitive global value chain. Most certified farms in developing economies prefer to export to developed countries (Collins and Dunne 2007; Raynolds et al. 2004). According to Sustainable Development Goal (SDG) 8 of the International Labour Organization (ILO), decent work is associated with the effectiveness of many physical, economic and social indicators for functional upgrading of value chains, including economic development of certified farms and social upgrading for workers (Kadigi et al. 2007; ILO 2015). These aspects of on-farm labor rights are periodically inspected by consultants to assess compliance. Requirements include occupational safety and health training, basic hygiene to prevent disease, protective clothing to prevent skin cuts and exposure to hazardous substances, first aid kits, warning signs in hazardous areas, and other social and economic measures for labor welfare (Global GAP 2016).

1.2 Goals and Objectives

Effective post-harvest value chain management is essential for dealing with problems such as low quality, the perishable nature of fruits, and pest issues. Mangoes of the highest quality can only be obtained with the most productive and efficient labor, which requires functional upgrading in terms of social and economic aspects of decent work to ensure the highest satisfaction under the sustainable development agenda of the ILO, enabling them to be part of a competitive global value chain. Hence, on-farm worker issues are garnering prominent attention among international development agencies and global certification systems (ILO 2016; ICDD 2014; Global GAP 2016). Therefore, the implementation of labor standards at certified mango orchards is gaining ground in terms of social, economic and physical aspects. The current study was designed by generating a hypothesis that social upgrading under decent work agenda would lead to economic upgrading and benefits in premium-quality value chains distributed to on-farm workers at certified orchards (Chambers and Conway 1992).

The following objectives were set out for the study:

1. Comparative analysis of socioeconomic factors and decent work indicators in certified and non-certified orchards.
2. Assessment of the interdependence between the livelihoods (income) of on-farm workers and decent work indicators.
3. Recommendations for appropriate policy reforms to improve the on-farm industry.

2 Mango Industry and Value Chains in Pakistan

Mango (*Mangifera indica*), also known as the "king of fruits", is native to Burma and eastern India. Mango is the second highest fruit product in Pakistan, after citrus, and Pakistan ranks fifth in mango production worldwide (FAO 2015). Numerous varieties are being produced in our country, which are Dodheri, Anwar Ratol, Langra, Siroli, Malda, Alphonso, Fajri, Gulab Khas, Golden, Swarnarekha and Banganapalli categorized by size, taste, acidity, shape, aroma and color. Two varieties, Chaunsa and Sindhri, have the greatest commercial importance, in both local and global markets.

2.1 Industry

The main export markets for Pakistani mangoes are Saudi Arabia, the United Arab Emirates, the UK, Qatar, Iran,

Afghanistan and Oman (Government of Pakistan 2009; Ghafoor et al. 2009). Numerous initiatives have been undertaken by the Pakistani government and many international agencies to develop the export value chain in order to empower growers and exporters. However, traditional chains are facing many issues including global certification systems (Hazard Analysis and Critical Control Points [HACCP] and GLOBALG.A.P.), pest issues, poor working conditions and lack of institutional reforms.

Orchards in Pakistan can be grouped into two general categories, non-certified and certified, based on the quality of the mangoes produced. Traditional value chain mangoes from non-certified orchards are identified by classical standards and measurements of quality including aroma, appearance and size, and are typically sold in local retail roadside markets (CSF 2007; Mehdi et al. 2016). These traditionally harvested mangoes are full of sap burns, blemishes, harmful chemicals and pesticides. The use of wooden sticks is common practice in these orchards, which may lead to internal injury of the fruit. Thirty to forty percent of post-harvest losses occur in traditional value chains (Collins and Iqbal 2010). Wooden boxes are used, exposing the mangoes to pathogens. In addition, overfilling of boxes increases bruising of the fruit and physical damage.

2.2 Traditional Versus Best-Practices Value Chain and Role of Decent Work Certification

According to SDG 8 of the ILO, decent work is defined as "work that is productive and delivers a fair income, security in the workplace and social protection for families, better prospects for personal development and social integration, freedom for people to express their concerns, organize and participate in the decisions that affect their lives and equality of opportunity and treatment for all women and men" (ILO 2015).

In contrast, some GAP-certified orchards are now restructuring product flows, supplying mangoes to supermarkets in large cities such as Islamabad, Karachi, Faisalabad and Lahore, premium-quality outlets and international markets, because of additional quality attributes including blemish-free fruit, ethylene ripening, prestige, and cardboard packaging (ACIAR 2007; Mehdi et al. 2014). These orchards take suitable care of mangoes under compliance measures established by GLOBALG.A.P. (a certification system governing on-farm practices). Measures such as these not only increase market value, such as organic labeling, but may reduce pre- and post-harvest losses. A comparison of key activities performed in certified (decent work) and non-certified orchards is described in Table 1.

Higher benefit-cost ratios are achieved by these certified orchards relative to non-certified orchards because of premium-quality products (Mehdi et al. 2014). Due to the growing pressure for graded, certified and standardized products and price incentives, some farm enterprises in Pakistan are obtaining international certification such as GLOBALG.A.P., an on-farm certification system to enable entrance into the global value chains. GLOBALG.A.P. certification has been acquired by 24 mango farms in Pakistan (PHDEC 2016).

3 Conceptual and Empirical Framework

A review of the literature on the incorporation of on-farm workers found preliminary evidence of the contribution by agricultural on-farm workers to the development of sustainable agricultural practices (Hurst et al. 2005). At non-certified orchards, teenagers and children were found to be working under poor health and safety conditions on fruit farms, and workers were not allowed to forms unions (HRW 2002), whereas wage rates, and occupational safety and health (OSH) conditions were improving at certified orchards.

3.1 Conceptual Framework

Poor working conditions, with lack of access to water and other basic needs, as well as exposure to health hazards, have been highlighted in many previous studies (Collins 2009; Hale and Wills 2007; Smith et al. 2005; Oxfam International 2004). Both institutional supportive bodies and international compliance agencies can contribute significantly to sociodemographic improvement among the many value chain actors.

Global agro-based value chain standards are driven by producers or consumers concerned about decent work conditions for workers; this helps to promote the functional upgrading of on-farm workers because of consumer concerns about point of production and brand visibility, particularly in value chains that are consumer-driven. This study was developed by assuming the general hypothesis that upgrading of traditional value chain systems through compliance with food quality and safety standards under an international compliance structure would lead to social and economic upgrading, as shown in Fig. 1. To test this hypothesis, interdependence among different decent work indicators and livelihoods were assessed at the bottom of the global value chains, while different social, economic and physical decent work indicators were identified at different levels of the value chain to determine the improvement in upgraded value chains.

In the case of food and fresh fruit commodities, safety and quality measures are of great concern for supermarkets and consumers in developed countries (Serrat 2008; Humphrey and Memedovic 2006). Preliminary evidence shows that social upgrading (unionization) has contributed significantly to economic improvements as well as greater adoption

Table 1 On-farm value chain activities Source: field observations and group discussions

	Non-certified orchards	GLOBALG.A.P.-certified orchards (under international standards)
Pre-harvest practices	Off-season activities include pruning/trimming, plowing, irrigating and fertilizing	Certified orchards observe proper for worker occupational safety measures such as safety equipment, chemical storage in separate places, and proper training provided for farm workers
Harvesting	Hand-picking or through wooden sticks. Ugly blemishes, sap burns appear on the mango skin, which attracts insects. Transport of fruit from mango tree to packing area/packhouse is done in a pannier, with extra quantity of fruits in many folds over each other which leads to post-harvest losses	After ascertaining the maturity of the fruit, safe harvesting is conducted by means of an iron pole of variable length (cut-and-convey type of mango picker) in order to reduce sap burns, internal injury and fungal infection. Transport using special crates with only one layer of fruit, easy to sort by workers with decent work amenities (protective clothing according to the nature of the work, first aid kits, doctors on site, etc.)
Preliminary post-harvest handling	Non-certified orchards do not adhere to protocols such as export quarantines, or sanitary and phytosanitary measures such as de-sapping, a process of removing the plant sap from the fruit. Sap increases the chance of fungal attack, sap burns and blemishes on fruit	Certified orchards de-sap the fruit through a variety of ways, where physical de-sapping, turning of mangoes on specifically designed racks, is frequently used. Other methods involve de-stemming and dipping in 0.5% lime water ($Ca(OH)_2$) for 2–3 min
Ripening	Mangoes are ripened by traditional methods, which carry health hazards, such as the use of calcium carbide (carcinogen), known locally as masala, to accelerate the ripening process.	In certified orchards, the ripening process has shifted to organic compliance standards to some degree, as the ripening process has seen a paradigm shift towards ethylene chambers
Packaging	Packing experts have a specific role in on-farm industry at both non-certified and certified orchards. Mangoes are packed in wooden boxes over their capacity, which results in deterioration in quality and increased chance of fungal infection	Before packing, treatments such as the fungicide carbendazim or hot water treatment are applied at certified orchards to improve the shelf life and to protect from pests such as fruit flies in global value chains, and then packed and transported in cardboard boxes according to the size, variety and quality attributes set by buyers

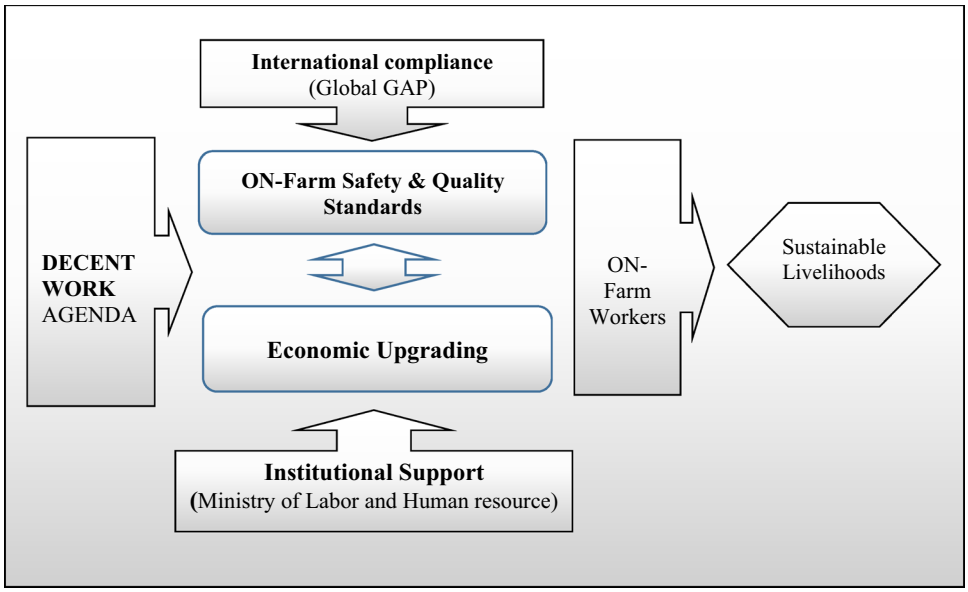


Fig. 1 Conceptual framework

of OSH standards for workers (Freeman 1981, 1982; Hirsch 1997). Government is often the principal actor in sustainable development initiatives due to its regulatory powers and influence on rural industry reforms (World bank 2017).

3.2 Empirical Framework

A model in empirical form can be characterized as

$$I_L = f\left(C, S_D, P_D, E_D\right) \tag{1}$$

where C is the continuous variables of socioeconomic attributes, S_D is the social context of decent work as dummy variable, P_D is dummy variables such as physical and human decent work indicators, and E_D is the economic aspect of decent work.

Equation (1) above can be amended as

$$I_L = A^{\ln} C_1^{\alpha 1\ \ln} C_2^{\alpha 2\ \ln} C_3^{\alpha 3} S_1^{\alpha 4} S_2^{\alpha 5} P_1^{\alpha 6} P_2^{\alpha 7} E_1^{\alpha 8} E_2^{\alpha 9} \varepsilon \tag{2}$$

where I_L is on-farm worker income (USD), C_1 is the educational level of the on-farm workers (grades passed), C_2 is worker experience in the on-farm industry (years), C_3 is the age of on-farm workers (years), S_1 is the social dummy variable for class discrimination (if discrimination, then $S^1=1$; otherwise = 0), S_2 is the dummy variable for unionization (if unions present, then $S^2=1$; otherwise = 0), P_1 is the physical dummy variable for OSH (if provided, $P^1=1$; otherwise = 0), P_2 is the human aspect dummy specialization (if provided, then $P^2=1$; otherwise = 0, E_1 is the financial services economic factor of decent work (if available, $E^1=1$; otherwise = 0), and E_2 is the compensation payments as dummy variable (if paid, then $E^2=1$; otherwise = 0.

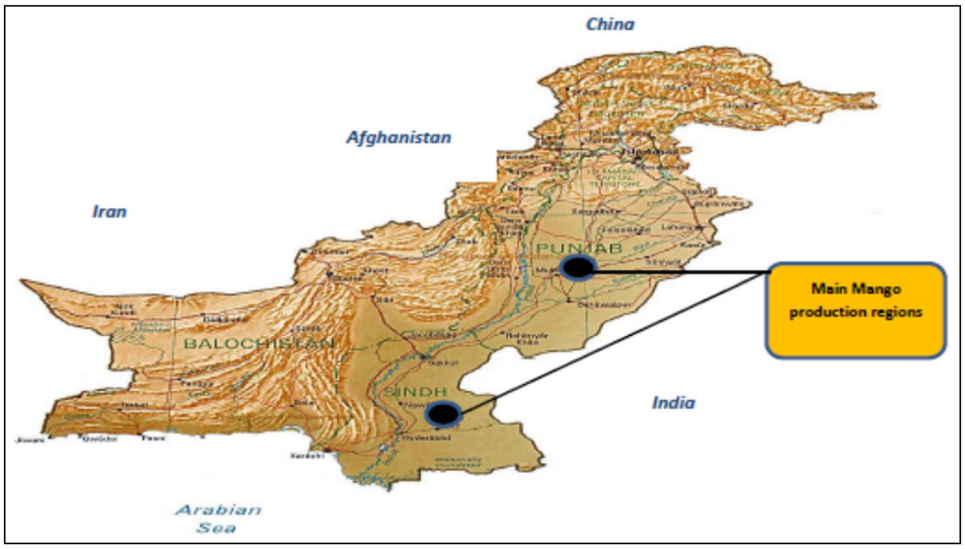
The comprehensive formula for the log–log regression model Eq. (2) is stated as

$$\begin{aligned} \ln I_L = {} & A + \alpha_1^{\ln} C_1 + \alpha_2^{\ln} C_2 + \alpha_3^{\ln} C_3 + \alpha_4 S_1 \\ & + \alpha_5 S_2 + \alpha_6 P_1 + \alpha_7 P_2 + \alpha_8 E_1 + \alpha_9 E_2 + \varepsilon \end{aligned} \tag{3}$$

4 Data

A case study methodology was employed to gain an in-depth understanding of how decency in an upgraded value chain affects on-farm worker income in both GAP-certified and other orchards. From the two Pakistani provinces of Sindh and Punjab, three major mango-producing regions (Multan, Hyderabad and Rahimyarkhan) were selected for collection of data. These provinces account for 95% of total mango production in Pakistan. A well-structured questionnaire was developed by focusing on the social, economic and physical impact of decent work.

Fifteen certified orchards were selected using simple random sampling. A total of 200 on-farm workers from both these orchards and other non-certified orchards were interviewed using purposive sampling. In-depth focus group discussions were conducted with the growers and farm contractors.



The analysis consisted of the following:

- A comparative analysis of GAP-compliant and non-compliant orchards by employing descriptive statistics techniques including frequencies, percentages and means
- Log–log regression analysis performed to assess the interdependence between the income of workers and socioeconomic and decent work variables.

According to *Econometrics*, log–log regression models are preferred when dealing with development-related approaches and variables (Gujarati 1995).

4.1 Descriptive Statistics and Decent Work Indicators

As described earlier, descriptive statistics were used for comparative analysis of decent work indicators and socio-demographic factors. Seventy-four percent of seasonal workers were employed at certified orchards, where 16.7% were permanent workers at non-compliant orchards, as shown in Table 2.

Eighty-three percent workers were seasonal at non-compliant orchards and 25.7% were permanent workers at certified orchards. Thus, a greater number of seasonal workers worked at certified orchards versus non-certified orchards. Economic upgrading in terms of producing premium-quality products correlates with social upgrading of on-farm workers, along with better earnings in local and global markets. Most on-farm workers in the traditional on-farm industry in Pakistan are economically depressed and socially deprived, as shown in Table 2, but circumstances are better in GAP-compliant orchards.

A significant difference was observed between GAP-compliant and non-compliant orchards in rural Pakistan. In certified orchards, 100% of on-farm workers were unionized, while only 4.3% were represented by labor unions in non-compliant orchards (Table 2). Class-based wage determination was seen in 16% of non-compliant orchards and 10% of certified orchards. Unionization has consequences for collective bargaining power, social dialogue, social security and the ability to voice concerns, as well as many other provisions in a decent work agenda.

Compensation payments are awarded to workers who are disabled, become ill or are injured during working hours. These comprise numerous types of disbursements, including worker injury benefits, and maternity and paid leave. Most growers allocate workers a piece of land upon which to build their mud houses. On-farm accommodation rates were very high at GAP-compliant orchards, with about 90% having mud houses, while a rate of 60% was found in the case of non-compliant orchards, as indicated in Table 2. Ninety-four percent of all non-compliant orchard workers were able to officially own their own houses, versus only 57% at compliant orchards. Forty-three percent and 7% lived in rented houses in GAP-compliant and non-certified orchards, respectively.

5 Results and Conclusions

As GAP-compliant orchards are driven by an international certification system and supermarkets in developed countries, they produce premium-quality products, obviously with a decent price for farm products, ultimately developing a huge potential for decent working conditions for workers. However, there is a lack of literature supporting

Table 2 Sociodemographic distribution and decent work indicators Source: author's calculations from survey 2016

Description	Non-certified orchards (%)	Certified orchards (%)	Total	
			Number	%
Worker type				
Permanent	16.7	25.7	115	57.5
Seasonal	83.3	74.3	84	42
Decent work indicators				
Labor unions	28.26	100	66	33
Professional training	31.43	66.67	85	42.5
Occupational safety and health	4.26	100	110	55
Class-based discrimination	15.71	10	22	11.5
Financial services	36.4	64.3	148	74
Compensation payments	27.7	66	94	47
Lifestyle				
Migrant	18.6	36.7	66	33
Three full meals at home	100	67.1	155	77.5
Clean water access	78	94	165	82.5
Cement house	40	10	38	19
Mud house	60	90	162	81
Rental house	6.667	42.86	65	32.5
Owned house	93.33	57.14	136	68
Joint family	68.6	86.7	149	74.5
Afford children's education	78	81	157	86.5
Married	67.1	73.3	138	69
Income (USD)/month				
≤$50.00	31.4	0	44	22
$50.01–100.00	50	13.3	79	39.5
$100.01–150.00	14.3	23.3	65	32.5
$150.01–200.00	2.86	43.3	10	5
$200.01–350.00	1.43	20	5	2.5
Experience (years)				
<10	46.67	77.1	12	6
11–20	20	17.14	145	72.5
20–25	22.33	1.42	42	21
No experience	10	4.28	3	1.5
Age (years)				
≤18	4.5	0	18	9
19–25	50	47.1	71	35.5
25–35	26.67	35.7	79	39.5
35–45	23.33	17.1	24	12

Frequencies include total sample (200)

the notion that social upgrading leads to economic upgrading of on-farm workers (Brown 2007; Locke et al. 2007). The research question should be investigated by determining the relationships between economic and social upgrading at farm level (Barrientos et al. 2010), particularly by inspecting the circumstances (decent value chain safety and quality standards) under which social development may progress towards economic upgrading.

5.1 Decent Work and Livelihoods (Income) Models (DLM)

Two separate log–log regression models were used to determine the effects of different decent work variables on worker income. All assumptions of ordinary least squares (OLS) like normality of data, linearity, perfect collinearity, homoscedasity were tested using SPSS Statistics version 22 software (IBM Corp., Armonk, NY, USA). Variables used in the livelihood models are explained in Table 3.

Table 3 Description of variables used in livelihood models Source: author's own calculations

Model variables	Minimum	Maximum	Mean	SD
Income (PKR)/month (DV)	4800 ($48)	32,000 ($320)	11,046.0 ($110.4)	6072.01 ($60.72)
Age (years)	12	45	26.39	7.812
Education (grades)	0	14	4.17	3.660
Experience (years)	0	21	6.00	4.723
Compensation payments	0	1	0.39	0.490
Occupational safety and health	0	1	0.30	0.461
Class discrimination	0	1	0.22	0.416
Labor unions	0	1	0.50	0.503
Specialized professional	0	1	0.30	0.461
Financial services	0	1	0.34	0.476

DV dependent variable

Table 4 Comparative results of log–log regression models Source: author's estimations from model (*$p<0.10$, **$p<0.05$, ***$p<0.01$)

Model variables IV (income)	Certified orchards		Non-certified orchards	
	Coefficients	Significance	Coefficients	Significance
Age	0.787	0.006***	0.137	0.276^{NS}
Education	0.071	0.166^{NS}	0.087	0.023**
Experience	0.064	0.051*	0.065	0.185^{NS}
Occupational safety and health	0.291	0.070*	0.01	0.174^{NS}
Professional training	0.323	0.049**	0.224	0.155^{NS}
Class discrimination	− 0.341	0.008***	− 0.222	0.006***
Labor union	0.397	0.081*	0.185	0.013**
Compensation payments	0.225	0.031**	0.074	0.324^{NS}
Financial services	0.045	0.656^{NS}	0.197	0.040**
Constant	6.619	0.000***	8.277	0.000***
R^2	0.909		0.739	
Adjusted R^2	0.826		0.546	
F value	10.534		1.012	
Durbin–Watson statistics	1.572		9.162	

IV independent variables

To assess the overall significance of the model, analysis of variance (ANOVA) was performed by assuming that all coefficients were equal to zero. The F value was very high (35.101; $p<0.000$), indicating that both models were highly accurate overall. Thus our independent variables have adequate explanatory power for regression of our dependent variable income of on-farm workers, a major indicator of livelihood. The model hit rates were 73.9 and 90.8% for certified and non-certified orchards, respectively, as the coefficient of determination (R^2) showed values of 0.785 and 0.908 (Table 4). According to the econometrics literature, it is better to use adjusted R^2 if our model has incorporated more than one independent variables (Gujarati 1995).

The age coefficient showed a positive relationship with wage in certified orchards and was significant at the 1% confidence level ($p<0.01$), with a 1% increase in age resulting in an increase in income of 0.78%, all else being equal, as indicated in Table 4. For non-certified orchards, the relationship was non-significant.

Education is a key factor in the level of technical skill and opportunity for promotion. It is a major contributor to a country's socioeconomic development (Griliches and Mason 1972). For non-certified orchards, the education coefficient also indicated a positive relationship with income, and was found to be highly significant ($p<0.05$), with a 1% increase in schooling years resulting in an increase in income of 0.08%, as denoted in Table 4, while certified orchards showed a non-significant effect.

Experience is also an important factor, with more experienced workers likely to earn a higher wage (Mincer 1974). In this study, at certified orchards, a 1% increase in experience was found to increase income significantly, by 0.06% ($p>0.10$), while it was non-significant in the case of non-certified orchards ($p>0.10$), keeping the effect of other

factors constant (Table 4). Experience increases labor technical skills to effectively deal with various technical issues and practices at the farm level and enables workers to elevate their work quality.

5.2 Economic Upgrading Through Decent Work

Global value chains are transforming their processes to enable the production of premium-quality and cost-effective products. A positive correlation may be assumed between social and economic upgrading (Sono 2013; Gundersen 2003), particularly with regard to increased production capacity of workers and greater flexibility. The most efficient and productive labor can thus be achieved by worker satisfaction during and after leaving the job.

Under the economic umbrella of decent work, compensation payments are an important factor. This variable showed a positive relationship with labor wages: workers receiving compensation payments, such as illness and maternity leave, leaves for special occasions and worker injury benefits, had 0.22% higher average income at certified orchards, keeping the effect of other factors constant ($p < 0.05$), as shown in Table 4. In contrast, at non-certified orchards this variable was non-significant. Financial services at non-certified orchards at the farm level had a significant effect at a confidence level of 5% ($p < 0.05$), showing that workers having financial services available received 0.14% higher average income, all else equal (Table 4). For certified orchards, this variable showed a non-significant effect.

5.3 Physical and Human Upgrading Through Decent Work

A sustainable mango value chain system can be achieved by integrating ILO SDGs into traditional production networks, particularly for workers and farmers with small holdings. GAP-compliant orchards are implementing OSH and different food quality standards. There is a common misperception that these OSH standards increase production costs, which may discourage the implementation of such standards, but in fact it increases the social and economic efficiency of the enterprise by improving its competitiveness.

This variable showed a significant effect at a 10% confidence level ($p < 0.10$), with a p value of 0.07. This model predicts that, keeping the effect of other factors constant, the availability of amenities such as separate chemical rooms, first aid kits, safety equipment, food hygiene, protective clothing, hazard signs, doctor contracts and proper sanitation facilities may result in 0.29% greater average income at certified orchards, as shown in Table 4. This variable showed a non-significant effect at non-compliant orchards.

While professional training for specialization was significant at the 5% confidence level ($p < 0.05$), with a p value of 0.049, the model revealed that the average income for workers receiving professional training was 0.32% greater (Bartel 1995). These are known as skilled agricultural workers, who are able to assume specific roles as a result of this on-farm industry training, such as machine operators, packaging experts, graders, supervisors and harvesters, and these career-oriented jobs affect income.

5.4 Social Upgrading Through Decent Work

Some studies, however, have revealed negative relationships for social and economic upgrading under specific conditions (Astill and Griffith 2004; Raworth 2004). Scientists should focus more on the social aspect of work than on the workplace with regard to long-term benefits (Nuwayhid 2004). Unionization is a major factor in wage determination and addresses decent work framework provisions including worker representation, social dialogue, and freedom to organize and associate, which are major points for social integration and personnel development according to ILO SDG 8 (Freeman 1984; Diewert 1974; ILO 2015).

Labor unions were found to have a significant effect in both types of orchards ($p < 0.05$). Average income for unionized workers was 0.39 and 0.18% higher at certified and non-certified orchards, respectively (Table 4) (Hirsch et al. 1997; Hirsch and Macpherson 2003; Mishel and Walters 2003). Class discrimination may contribute to social downgrading. This variable was highly significant at both certified and non-certified orchards at a 1% confidence level ($p < 0.01$). Workers who are subjected to discrimination based on class may receive on average 0.34 and 0.22% less income at GAP-compliant and GAP-non-compliant orchards, respectively. Hence, worker exploitation may cause social downgrading. This is a major factor affecting payment of wages in the developing world, especially in the South Asian countries (Banerjee and Knight 1985; Das and Dutta 2007; Best and Mamic 2008). These workers deserve attention by institutional supportive bodies and government, but no direct labor law exists for them in Pakistan, although India has special legislation for on-farm workers.

5.5 Conclusions and Policy Recommendations

- Social upgrading has implications for economic improvement in the mango value chain with regard to a decent work environment and improved worker income for premium-quality mango production at certified orchards.

- Decent work influences the effects of various socioeconomic indicators of on-farm worker livelihoods, which ultimately informs the value chain development process.
- With the global compliance drive to certify orchards under the food quality and worker safety standards, these orchards have greater potential to improve the livelihoods of on-farm workers.
- Growers are reluctant to adopt decent work practices due to the common misperception that maintaining compliance standards will increase the cost of production. In reality, meeting compliance measures will ultimately improve farm competitiveness.
- Socially upgraded labor contributes positively to economic improvement for workers and farms in terms of higher wages and premium-quality products, respectively.
- This study has utilized an integrated approach to analyze social, economic and OSH aspects of decent work in global production networks, with regard to the diverse income gap among both growers and workers. Hence, there is an urgent need to ensure that benefits are equally distributed among workers and producers.
- Government should develop a more effective policy for socioeconomic development to focus on both labor unions to represent workers, and farm-level initiatives to increase awareness (to minimize class-based discrimination at farms).
- There is huge potential for functional upgrading (labor-intensive), because workers with low skill levels lean towards migration to find healthier work environments where they can obtain better working conditions.
- Technical occupations are being promoted in a decent way at the certified orchards for trained workers. Vocational training institutes may also initiate short diploma courses for on-farm professions.

References

ACIAR (2007) A constraint analysis of Pakistan mango supply chain. Australian Centre for International Agricultural Research, Canberra

Adato M, Meinzen-Dick R (2002) Assessing the impact of agricultural research on poverty using the sustainable livelihoods framework. International Food Policy Research Institute, Washington

Astill A, Griffith M (2004) Clean up your computer: working conditions in the electronics sector. CAFOD, London

Banerjee B, Knight JB (1985) Caste discrimination in the Indian urban labour market. J Dev Econ 17(3):277–307

Barrientos S, Gereffi G, Rossi A (2010) Economic and social upgrading in global production networks: developing a framework for analysis. Int Labor Rev 150(3–4):319–340

Bartel AP (1995) Training, wage growth, and job performance: evidence from a company database. J Labor Econ 13(3):401–425

Best S, Mamic I (2008) Global agri-food chains: employment and social issues in fresh fruit and vegetables. International Labour Organization, Geneva

Brown D (2007) Globalization and employment conditions study. World Bank, Washington **(social protection discussion paper 0708)**

Chambers R, Conway G (1992) Sustainable rural livelihoods: practical concepts for the 21st century. IDS, Brighton **(IDS discussion paper 296)**

Collins JL (2009) Threads: gender, labor, and power in the global apparel industry. University of Chicago Press, Chicago

Collins RJ, Dunne AJ (2007) A rapid supply chain appraisal approach for agribusiness development projects. In: II International symposium on improving the performance of supply chains in the transitional economies paper no. 794 Sep 23, pp 73–80

Collins R, Iqbal M (2010) Integrating post-harvest, marketing and supply chain systems for sustainable industry development: the Pakistan mango industry as work in progress. In: Batt PJ (ed) Third international symposium on improving the performance of supply chains in the transitional economies, 4–8 July 2010, Kuala Lumpur, Malaysia

CSF (2007) Horticulture action plan: background paper. Competitive Support Fund. Ministry of Finance, Government of Pakistan, Islamabad

Das MB, Dutta P (2007) Does caste matter for wages in the Indian labor market?. World Bank, Washington **(draft paper)**

Diewert WE (1974) The effects of unionization on wages and employment: a general equilibrium analysis. Econ Inq 12(3):319–339

FAO (2015) FAOSTAT, Food and Agriculture Organization of the United Nations (FAO) October 03, 2015

Freeman RB (1981) The effect of unionism on fringe benefits. ILR Rev 34(4):489–509

Freeman RB (1982) Union wage practices and wage dispersion within establishments. ILR Rev 36(1):3–21

Freeman RB (1984) Longitudinal analyses of the effects of trade unions. J Labor Econ 2(1):1–26

Ghafoor A, Mustafa K, Mushtaq K, Abedullah (2009) Cointegration and causality: an application to major mango markets in Pakistan. Lahore J Econ 14:85–113

Ghani MA (2012) Article: labour laws and agriculture workers. Pakistan. Business recorder. Available at https://fp.brecorder.com/2012/01/201201151142813/. Accessed 15 Jan 2012

Global GAP (2016) Database, certified orchards in Pakistan. Available at https://www.GlobalGAP.org

Government of Pakistan (2009) Pakistan economic survey 2013–14. Government of Pakistan, Finance Division, Economic Affairs Wing, Islamabad

Government of Pakistan (2016) Agricultural statistics of Pakistan 2013–14. Pakistan Bureau of Statistics, Statistics Division, Islamabad

Griliches Z, Mason WM (1972) Education, income, and ability. J Political Econ 80(3, part 2):74–103

Gujarati DN (1995) Basic econometrics, 3rd edn. McGraw-Hill Publishing Company, Maidenheach

Gundersen B (2003) Unions and the well-being of low-skill workers. Dissertation, George Warren Brown School of Social Work, Washington University

Hale A, Wills J (2007) Women working worldwide: transnational networks, corporate social responsibility and action research. Glob Netw 7(4):453–476

Hirsch BT (1997) Unionization and economic performance: evidence on productivity, profits, investment, and growth. Fraser Institute, Vancouver
Hirsch BT, Macpherson DA (2003) Union membership and coverage database from the current population survey: note. ILR Review 56(2):349–354
Hirsch BT, Macpherson DA, DuMond JM (1997) Workers' compensation recipiency in union and nonunion workplaces. ILR Rev 50(2):213–236
HRW (2002) Tainted harvest. child labor and obstacles to organizing on Ecuador's banana plantations. Human Rights Watch, New York
Humphrey J, Memedovic O (2006) Global value chains in the agrifood sector. A report submitted to (FAO) Food and Agriculture Organizations of United Nations. https://agris.fao.org
Hurst P, Termine P, Karl M (2005) Agricultural workers and their contribution to Sustainable Agriculture and Rural Development, International Labour Organization (ILO), International Union of Food, Agricultural, Hotel, Restaurant, Catering, Tobacco and Allied Workers' Associations (IUF). Report submitted to (FAO) Food and Agriculture Organizations of United Nations. 03 April
ICDD (2014) Supply Chain Governance: A decent work approach to optimize mango value chain in Pakistan. Project details. Available at http://www.uni-kassel.de/einrichtungen/international-center-for-development-and-decent-work-icdd/research/research-2015-2019/1-global-agricultural-production-systems-gaps.html
ILO (2015) International Labour Organization, Goal #8, agenda for sustainable development; decent work and economic growth. International Labour Organization, Geneva. Available at https://www.ilo.org/wcmsp5/groups/public/---ed_norm/---relconf/documents/meetingdocument/wcms_545837.pdf
ILO (2016), Decent Work Programme in Pakistan, SDG N0. 8, International Labour Organization. Available at https://www.ilo.org/wcmsp5/groups/public/---ed_mas/---program/documents/genericdocument/wcms_561025.pdf
Kadigi RM, Mdoe NS, Senkondo E, Mpenda Z (2007) Effects of food safety standards on the livelihoods of actors in the Nile perch value chain in Tanzania (No. 2007: 24). DIIS working paper
Locke R, Kochan T, Romis M, Qin F (2007) Beyond corporate codes of conduct: work organization and labour standards at Nike's suppliers. Int Labour Rev 146(1–2):21–40
Mehdi M, Adeel A, Ahmad Z, Abdullah M, Hussain F (2014) Effectiveness of a "whole of chain" approach in linking farmers to market: a case of Pakistan mango market. UMK Procedia 1:57–62
Mehdi M, Ahmad B, Yaseen A, Adeel A, Sayyed N (2016) A comparative study of traditional versus best practices mango value chain. Pak J Agri Sci 53(3):733–742
Mincer J (1974) Schooling, experience, and earnings. Human Behavior and Social Institutions No. 2
Mishel L, Walters M (2003) How unions help all workers. EPI Briefing Paper# 143
Nuwayhid IA (2004) Occupational health research in developing countries: a partner for social justice. Am J Public Health 94(11):1916–1921
Oxfam International (2004) Trading away our rights: women working in global supply chains. Oxfam International, Oxford
PHDEC (2005) Mango marketing strategy, Pakistan Horticultural Development and Export Company, Lahore
Raworth K (2004) Trading away our rights: women working in global supply chains. Oxfam Policy Pr Priv Sect 1(1):1–52
Raynolds LT, Douglas M, Peter LT (2004) Fair trade coffee: building producer capacity via global networks. J Int Dev 16(8):1109–1121
Scherrer C (2017) Addressing the decent work deficit in agricultural supply chains. Paper presented in 5th conference on regulating for decent work, 3–5 July, ILO Geneva
Serrat O (2008). The sustainable livelihoods approach, DC: Asian Development Bank. Knowledge Solutions. November, 15. https://www.adb.org/Knowledgesolutions
Smith S, Tallontire A, Dolan C, Barrientos S (2005) Reaching the marginalised? Gender value chains and ethical trade in African horticulture. Dev Pract 15(3–4):559–571
Sono HS (2013) The effects of Adra's mango project on livelihoods in the Yilo Krobo district. Doctoral dissertation, University of Ghana)
Wognum PM, Bremmers H, Trienekens JHVD, Vorst JGAJ, Bloemhof JM (2011) Systems for sustainability and transparency of food supply chains—current status and challenges. Adv Eng Inform 25(1):65–76
World Bank (2017) Annual report. Available at http://pubdocs.worldbank.org/en/908481507403754670/Annual-Report-2017-WBG.pdf

Muhammad Bilal Ahsan has passed Master of Science in Agribusiness with high distinction and currently, serving as Lecturer at the University of Agriculture, Faisalabad (Burewala Campus). His research interests are sustainable rural development, value chain analysis and consumer behavior.

Mubashir Mehdi is Assistant Professor at the Institute of the Business Management Sciences University of Agriculture, Faisalabad, Pakistan. He holds a Ph.D. in agribusiness from the University of Queensland, Australia. His research focuses on agricultural marketing, management, and overall supply chain analysis. He has been actively engaged in industry-focused R&D and capacity building activities.

Burhan Ahmad earned his PhD Degree from Norway and is working as Assistant Professor in the Institute of Business Management Sciences, University of Agriculture, Faisalabad, Pakistan. His research interests are international trade and the WTO, global marketing, agricultural value chains, market functioning, price volatility and foreign direct investment. His recent publication is 'Spatial differences in rice price volatility: A Case of Pakistan' in The Pakistan Development Review (PDR) Vol.56 (3), (2017).

Umar Sohaib Ahmad passed his Master of Science degree from the University of Agriculture, Faisalabad, and serving as research assistant in USAID-funded project in Pakistan. His research interest is an analysis of the marketing system of different fruit crops.