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Impact of projects initiating group marketing of smallholder farmers—A case study of pig producer marketing groups in Vietnam

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ABSTRACT

In recent years, several projects in Vietnam have focused on establishing farmer groups to link small-scale pig producers to markets in order to improve their livelihoods. To compare the success between different approaches and by contrasting them to individual farmers without joint marketing, data were collected from 286 members of 18 pig marketing groups initiated by seven projects and from 479 non-members in three provinces and the capital of Vietnam. Groups were categorized in Common Interest Groups, Cooperative Groups and Cooperatives. All groups were comparatively described according to member set-up, management, financing and marketing. Propensity score matching was used to evaluate the economic success, as one of the key factors for a long-term operation of farmer groups. Results showed that the intervention projects supporting farmer groups with training and in-kind subsidies seem to have the highest impact on the increase of income of members in comparison with non-members.

1. Introduction

Small-scale producers in developing countries often have limited opportunities to sell their products in an efficient and profitable manner. In recent years, several intervention projects have focused on linking farmers to markets in order to improve their livelihoods (e.g. Asia-Pacific Association of Agricultural Research Institutions, 2008; Stringfellow, Coulter, Lucey, McKone, & Hussain, 1997). In 2003, the International Fund for Agricultural Development (IFAD) pointed out that markets and improved market access is critical to rural poor households to overcome their poverty and would thus contribute to achieving the Millennium Development Goals. The World Development Report 2008 (The World Bank, 2007) also pursued the approach of linking farmers to the market.

Establishing farmer groups or cooperatives is one way to improve access of farmers to markets and increases their bargaining power in marketing interventions (e.g. Castella & Bouahom, 2014; Fischer & Qaim, 2012). Over the past 25 years, the number of established farmer groups and 'new-style cooperatives' has increased considerably in Vietnam (Wolz & Duong, 2010). Besides the efforts of the Vietnamese Government, numerous international organizations are supporting farmers in improving their access to markets. Among those organizations, the Australian Agency for International Development (AusAID), IFAD, the World Bank Group (WB), OxFam, the Catholic Relief Service (CRS) and the SNV Netherlands Development Organization have been involved in establishing farmer groups and linking farmers to markets in Vietnam (Hoang & Graham, 2006; Rankin & Russel, 2005). Although ample literature is available for farmer groups in Vietnam focusing on coffee, vegetables, fruits and aquaculture (e.g. Ha, Dijk, Bosma, & Sinh, 2013; Moustier, Tam, Anh, Binh, & Loc, 2010; Rankin, Dunne & Russel, 2008; Sustainable Commodity Assistance Network, 2011), only few publications have analysed livestock farmer groups. Yet, surprisingly, while there are studies on formal groups, such as cooperatives (e.g. Quach & Kawaguchi, 2003; Binh, Thai, Quang, & Moustier, 2007) and informal ones, such as common interest groups (e.g. Hoang & Graham, 2006), with different production focus, such as beef (e.g. Anh, Tuan, & Truong, 2010), there is limited research on pig production groups in Vietnam; although, pig production is an essential source of livelihood for small-scale farmers in Vietnam (Lemke, Kaufmann, Thuy, Emrich, & Valle Zárate, 2007). With reference to pig production, Binh et al. (2007) showed that members of a pig cooperative were able to increase their income by reducing their transaction costs and ensuring quality products for

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the consumer. Even though this study included a profit calculation comparing members and non-members, to our knowledge, there are no studies yet applying propensity score matching to compare the economic effect of being a member of farmer groups established with the help of intervention projects.

Although it is widely known that collective action can support farmers in increasing their income (e.g. Markelova, Meinzen-Dick, Hellin & Dohrn, 2009), several examples from the past have shown that the establishment of farmer groups or cooperatives has not always been successful (e.g. Cazzuffi & Moradi, 2012; Garrido, 2007; Attwood & Baviskar, 1987). Golovina and Nilsson (2011) showed that top-down established and organized cooperatives in Russia failed due to limited knowledge of the governmental administration about the conditions and needs of the farmers. Following Sexton and Iskow (1988) several studies have analysed the factors for success and failure of farmer groups or cooperatives in different countries. Most of the studies found the root causes for success or failure to be economic (e.g. Bruynis, Goldschmith, Hahn, & Taylor, 2011), attitudinal-behavioral (e.g. Bhuyan, 2007), financing (e.g. Keeling, 2004) and management/operational (e.g. Azadi, Hosseininia, Zarafshani, Heydari, & Witlox, 2010; Mahazril, Hafizah, & Zuraini, 2012) factors. Garnevska, Liu, and Shadbolt (2011) showed that a stable legal environment and appropriate government policies were also important. In Vietnam, the motivation among farmers for the creation of farmer groups might be additionally hampered due to the history of the 'old-style socialist cooperatives' and the established groups may still not be working according to democratic principles (Anh et al., 2012). Quach and Kawaguchi (2003) studied two dairy cooperatives in North and South Vietnam and found a great reluctance among farmers to join a cooperative, because membership benefits were not clearly perceived and farmers rather joined a group because of strong interpersonal and community bonds between villagers.

The aim of this study was to compare different pig production farmer groups (common interest groups, cooperative groups and cooperatives) that have been established by seven different projects in selected areas of North and Central Vietnam, according to their structure and operation as well as their impact on farmer's income. Members of farmer groups are compared to non-members.

2. Background

2.1. Cooperative development in vietnam

During colonialism and until 1953, only a small percentage of French and Vietnamese landlords or rich peasants owned large amounts of land, whereas more than half of the rural populations were either poor farmers or landless workers (Raymond, 2008). In the mid-twentieth century, Vietnam followed the centrally planned, socialist economic system from the Soviet Union and enacted the Land Reform Law. Agricultural production cooperatives (APCs) replaced private farming (Wolz & Duong, 2010). The APCs were state-owned. The management and organizational set-up was bureaucratic, for example, farmers worked in production brigades under the supervision of brigade management committees and the cooperative's committees for management and inspection. Managers awarded workpoints to brigade members for their collective labour which were worth a portion of the cooperative's net harvest (Raymond, 2008).

In response to the economic crisis, the agricultural sector underwent significant reforms since the end of the 1970s. In January 1981, the government introduced the household contracting system (Directive No. 100CT/TW of the Central Committee) and thus, legalized first local market mechanisms. These reforms also allowed farmers to use 5% of their land privately and to sell their surplus on the market instead of selling it to the state. The changes were finally secured by an additional resolution (Resolution No. 10 NQ/TW) and the Land Law in 1993 (revised in 1998 and 2000).

The reforms recognized family farms as the major source of agricultural production and no longer – as previously – the APCs. Family farming was partly re-established (Cox & Le, 2014; Wolz & Duong, 2010; Dieu, 2006). Since land was then lacking for the APCs, the Vietnamese government supported the transformation from as many APCs or 'old-style cooperatives' as possible into agricultural service cooperatives or 'new-style cooperatives'. Wolz (2000) mentioned that in 1994 about half of the 'old-style cooperatives' were no longer operating and only existed on paper for various reasons. In addition, informal farmer organizations emerged rapidly during this time.

In 1997, the Law on Cooperatives was enacted and then amended in 2012. For more detailed information on the cooperative development in Vietnam, see e.g. Cox and Le (2014), Wolz and Duong, (2010) and Fforde and Huan (2001).

2.2. Farmer groups

Throughout this paper, the term 'farmer group' refers to different stages of farmer organizations in Vietnam. Pig production groups are grouped into common interest groups (CIG), cooperative (or collaborative) groups (CG) and cooperatives.

CIGs are the simplest form of farmer organizations. These groups are self-managed by farmers sharing a common interest. In the pig production sector, CIGs are usually established by farmers of one village, only rarely two or more villages are involved. Live pigs and pork can be sold through the support of the groups, but also individually. The CIGs mostly have a common saving fund, which in turn can be lent to other members. The CIGs are registered through the Commune or Town People's Committee (SCAN, 2011).

A CG requires a more formal structure of at least three individuals and a joint cooperative group contract. The Decree 151/2007/ND-CP, passed by the government of the Socialist Republic of Vietnam in 2007, regulates the organization and operation of a CG. CGs are certified by the People's Committees of the commune, ward or town (SCAN, 2011). They follow common cooperative principles based on the values of self-help, self-administration and self-responsibility (DGRV, 2014). The long-term purpose of a CG is its transformation into a cooperative.

Cooperatives are established formally under the Vietnamese Law on Cooperatives and defined as a collective economic organization. At least seven members are necessary for the establishment of a cooperative. The cooperative operates under the principles of cooperation: self-control, self-responsibility, equality and democratic management. The Vietnam Co-operative Alliance (VCA) is a social-economic organization working at national and provincial levels with the task to provide consultancy and support to the cooperatives with legal aid or training.

2.3. Projects

Different projects have been initiated by international and local organizations to provide support to farmer groups in Vietnam. Fforde (2008) found that donor development agencies focus on participatory, community-based projects; yet, intervention projects in Vietnam operate with or through official structures controlled by the Party.

In Cao Bang, a project funded by the International Funds for Agricultural Development (IFAD) with the technical assistance of Lux-Development (Lux-Dev.) supported farmers in establishing CIGs. From 2008 to 2014, a total of 451CIGs were established in the province, with 22 of these focusing on the production of 'black village pigs'. These 22 farmer groups were registered in 2009. The IFAD

project supported CIG members in achieving a better market access for their products by providing training to farmers. The project classified CIGs according to the level of market access into very good market access (31%), acceptable market access (55%) and no market access (14%). In the long run, a limited number of CIGs with very good market access could be transformed into cooperatives.

In Lao Cai, two different projects were included in this study. One project funded by OxFam Australia and Great Britain supported farmers in establishing CIGs.

First, CIGs were established between 2011 and 2013 and subsequently a better market access was pursued in the consecutive years from 2013 to 2015. The main objective was to strengthen women's rights and to improve their income. The project was built on existing structures such as the Women's Union. Besides training, the project also provided in-kind contributions.

The other project was funded by the World Bank (WB) in Muong Khuong district of LC and established a white pig production CIG to improve the livelihood opportunities of the rural poor and ethnic minorities. In 2012, the project delivered in-kind payments to a few poor farmers, who were selected by the local authorities. The potential candidates needed to have knowledge in pig production, an existing pig confinement and to be classified as poor according to the official Vietnamese poverty criteria. The threshold for poverty is set at 400,000 VND per person per month (~19 USD/person/month) in rural areas (The World Bank, 2012).

In Ha Tinh, three different projects were considered for this study. From 2007 to 2012, a project funded by IFAD with the technical assistance of the German Agency for International Cooperation (GIZ) aimed at contributing to a sustainable income for the rural poor through improving access to and participation in markets. Farmers were supported in establishing CIGs through training. Most of the CIGs were established in 2010. Few CIGs were transformed into CGs or cooperatives.

In 2010 and 2012, the non-governmental organization (NGO) 'Sustainable Rural Development' established farmer groups in Ha Tinh. The project supported farmers with training through the local veterinary and agricultural authorities. In 2011, the Charoen Pokphand Group (CP) started contract farming with pig farmers in Ha Tinh. The duration of the contract was 3 years. The farmers were registered as a pig production group by the local authorities.

The farmer group in Hanoi was transferred from an animal breeding club to an officially registered 'new-style cooperative' in 2007 with the support of the Vietnamese government.

3. Methods of data collection and statistical analysis

3.1. Study area characteristics

This study was carried out in provinces of North (Cao Bang and Lao Cai) and Central (Ha Tinh) Vietnam, as well as the capital Hanoi.

These provinces are among the ten poorest areas of Vietnam. In 2012, the monthly average income expressed as a percentage of the average in Vietnam (1579 thousand Vietnamese Dong (VND)) was 69% in Lao Cai, 67% in Cao Bang and 82% in Ha Tinh (General Statistics Office of Vietnam, 2012). Hanoi is the capital and the political centre of the country. It is situated in Northern Vietnam and is the second largest city in Vietnam. The chosen district, Soc Son, is a rural area in the North of Hanoi.

Cao Bang (CB) and Lao Cai (LC) are two provinces located in the Northeast and Northwest of Vietnam, respectively. Both provinces are mountainous with forests comprising 90% and 30% of the land area in CB and LC, respectively. Ethnic minorities account for 96% of the population in CB and around 64% in LC. The largest groups belong to the Tay-Thai and Hmong-Mien ethnic language group. The two provinces share a border with the People's Republic of China. Both, the provincial capital Lao Cai and the bordering City of Hekou Yao Autonomous County in China, are important trade posts and have a long on- and off-going trading tradition (Chan, 2013). In CB, two rural districts, Nguyen Binh and Thong Nong, were chosen for the research. The research in LC was carried out in the district of Bat Xat and Muong Khuong. In the selected districts, approximately 80–90% of all households are engaged in small-scale pig production.

Ha Tinh (HT) is a mountainous and hilly province in the Central Coastal Area, sharing a border with Lao People's Democratic Republic in the West. The overwhelming majority (99%) of the population in this province are Vietnamese (Kinh). In HT, the three rural districts chosen for the present research were Can Loc, Cam Xuyen and Nghi Xuan.

The main economy of Hanoi is industrial production and trade, with agriculture losing its importance. Agriculture and forestry are still forming the primary sector of industry in CB and LC. However, cross-border trade with China in LC is gaining in economic importance. In HT, agro-forestry-fisheries account for one third of the provincial economic activities.

3.2. Data collection

The data for this study was collected by a survey conducted from September to December 2013. A total of 765 farmers were interviewed. Among them, 286 were members of 18 pig production groups and 479 were non-members. The number of female farmers was much higher, 485 women compared to 280 men. The selection of the respective projects was based on a snowball sampling. Criteria for selection were supported for the establishment of farmer groups, marketing or breeding pigs. The farmer groups were selected based on the pre-information given by the respective projects, i.e. IFAD in CB, OxFam in LC and GIZ in HT. No pre-information was available for the farmer group established with the help of WB. Due to restricted work permits, the households interviewed could not be randomly selected, but were assigned by the leader or vice leader of the farmer group or the village head. In LC and CB, the villages and non-members interviewed were chosen by the local authorities due to security restrictions in the border area to China. The structure of the sample is shown in Table 1.

Due to time limitations not all farmer groups in CB and LC could be interviewed. In CB only four out of 22CIGs were interviewed, in LC nine out of 15 possible interviews were completed.

Interviews were conducted with trained enumerators and additionally local translators were used to address elderly people and women of ethnic minorities, who felt more comfortable speaking their local language. The structured questionnaires for the members contained questions concerning the organizational set-up of the respective group, e.g. information on membership fees, financial transparency about saving funds, leader board, meetings, rules and regulations and capital building. Further questions were identical to those for non-members.

Non-members were initially asked to give their reasons for non-participation. General information on household characteristics and livestock keeping, production information on feeding, housing, animal health care, total and off-farm income in 2009 and 2012 (in VND), extension or veterinary care services, positive aspects and limitations of pig production was captured from all farmers.

Data on total income in 2009 and 2012 were generated by the recall method during a one-time appointment. The given information was verified by calculating product sales of each product (e.g. tobacco, poultry, cattle, pigs, rice, maize etc.) and off-farm income during the respective year. Also, the financial support sent to their parents by children working abroad was asked, and in-kind or in-cash subsidies were inquired. In case the interviewees had difficulties in recalling the income, other family members helped in retrieving the data. Non-plausible income data was discarded.

Table 1
Investigated farmer groups and their characteristics.

	Cao Bang[1]	Lao Cai[2]	Lao Cai[3]	Ha Tinh[4]	Ha Tinh[5]	Ha Tinh[4]	Hanoi[6]	Ha Tinh[7]
No of farmer groups interviewed	4[9]	8[9]	1[9]	1[9]	1[10]	1[9]	1	1
Year of establishment	2009	2012	2012	2012	2010	2011	2007	2011
No of members (in total)	104	207	10	35	9	11	30[11]	5
Average group size	17–35	22–30	10	35	9	11	5	5
No of farmers interviewed	61	120[8]	9	27	7	6	3	3
Member set-up:								
Male and female members in the farmer group	Yes	No (only female)	Yes	No(only female)	Yes	Yes	No (only male)	Yes
Management:								
Elected leaderboard	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rules and regulations	Yes	Yes	No	Yes	No	Yes	Yes	Yes [12]
Sanctions	Yes	Yes	No	Yes	No	Yes	No information	Yes
Financing of farmer group:								
Membership fee	Yes	Yes	No	Yes	No	No[13]	No[13]	No
Saving funds	Yes	Yes	No	Yes	No	Yes	No	No
Market via farmer group	No	No	No	No	Yes	Yes	Yes/No[14]	Yes
Market	Cao Bang Local traders Occasionally China	Lao Cai Local traders Occasionally China	Lao Cai Local Traders	Ha Tinh Local traders	Ha Tinh Local tradersHa Tinh	Ha Tinh Ha Tinh	Hanoi Hanoi	Ha Tinh CP
Project								
Training by project	Yes	Yes	Yes	Yes	Yes [15]	Yes		No
Subsidies by project (in-kind payments)	No [16]	Yes	Yes	No	No	No[17]		No

[1] IFAD: International Fund for Agriculture Development and LuxDev: Lux-Development S.A; [2] OxFam Australia and Great Britain; [3] The World Bank Group; [4] SRD: Sustainable Rural Development; [5] GIZ: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH; [6] Viet. Gov't: Vietnamese Government; [7] CP: Charoen Pokphand Group; [8] Sin Lung Chai A and Sin Lung Chai B each had 2 farmer groups; [9] CIG: Common Interest Group, [10] CG: Cooperative Group; [11] The total amount of members were 30 but only 5 members raised pig; [12] Regulations from CP about pig production; [13] No yearly membership fee but contribution at the beginning; [14] optional; [15] Training was received from IFAD; [16] Mong Cai sows were distributed to poor households but not especially to farmer groups; [17] Subsidy from commune, not project.

Income of less than one million VND (~48 USD) per year was also regarded as missing value due to lack of plausibility. In total, 40 households were excluded. Farmer groups were defined as profitable when income of the members increased.

3.3. Data analysis—propensity score matching (PSM)

Our purpose of comparing different pig production farmer groups (common interest groups, cooperative groups and cooperatives) in their impact on farmers' income could not be achieved by simply comparing the mean income of members of the farmer group to those of non-members, due to creating selection bias. Additionally, due to the political system, a random selection was not possible. Therefore, propensity score matching (PSM) was used as a common approach to assess the impact of intervention projects or programmes (Heckman, Ichimura & Todd, 1997; Imbens & Wooldridge, 2009).

For the practical implementation of PSM the guidelines of Caliendo and Kopeinig (2008) and Müller (2012) were followed. The effect of different projects on income differences of treated individuals (members of farmer group) was compared by a general linear model. The income difference was generated by deducting the income in 2009 from the income in 2012. The propensity score, defined as the conditional probability of being in the treatment group, was estimated using logistic regression in which the treatment participation is used as the outcome variable and the selected covariates as predictors. PSM was then applied to evaluate the effect of project intervention on the increase of income (outcome variable) for members of a farmer group (treated individuals) in comparison with the increase in income of similar non-members (control). However, whether training or in-kind-subsidies was the main focus of the intervention projects was not considered in the analysis. The considered covariates were geographic location (province), as well as those drawn from socio-demographic and economic information including family size, age, ethnicity (grouped into Viet-Muong, Tay-Thai, Hmong-Mien, and Sino-Tibetan groups based on eight Vietnamese language groups. As the Sino-Tibetan category contained only a small number of studied households, the category was excluded from the sample), education (formal, primary, secondary and college education), use of extension services (dummy 1 for yes and 0 otherwise), off-farm income (dummy), farmland size (dummy 1 for greater than a hectare and 0 otherwise), cattle and pig herd sizes. Family size, age, cattle and pig holdings were included as quantitative variables. The propensity score matching was then performed using kernel-based matching by defining bandwidth of 0.01.

Heckman's difference-in-differences (DID) matching estimator was chosen to analyse the income difference of the two groups (treatment and control) over time (2009 and 2012). The income of members of a farmer group (treatment) was expected to increase, since the participation in a pig production group promises better market access. Differences between the treatment and the control groups in the matched propensity scores were assessed graphically and common support of propensity score was determined (Fig. 1). Lack of common support was identified in areas where no overlap occurred.

The success of matching was checked using the covariates imbalance testing procedure (pstest) that analyses measures of the imbalance of covariates between treated (members) and non-treated (non-members) groups, and standardized bias, before and after matching. The hypothesis that the mean of each covariate did not differ significantly after matching between the treated and control was accepted.

The two most frequently estimated parameters in PSM analysis are the average treatment effect on the treated (ATT) and the population average treatment effect (ATE). ATT is the most prominent evaluation parameter, the value of which is the difference between expected outcome values with and without treatment for those, who actually participated in the treatment (Caliendo & Kopeinig, 2008). Thus, ATT was used to evaluate the effects on treatment on household income. For statistical analysis, STATA 11 (StataCorp, 2009) was used.

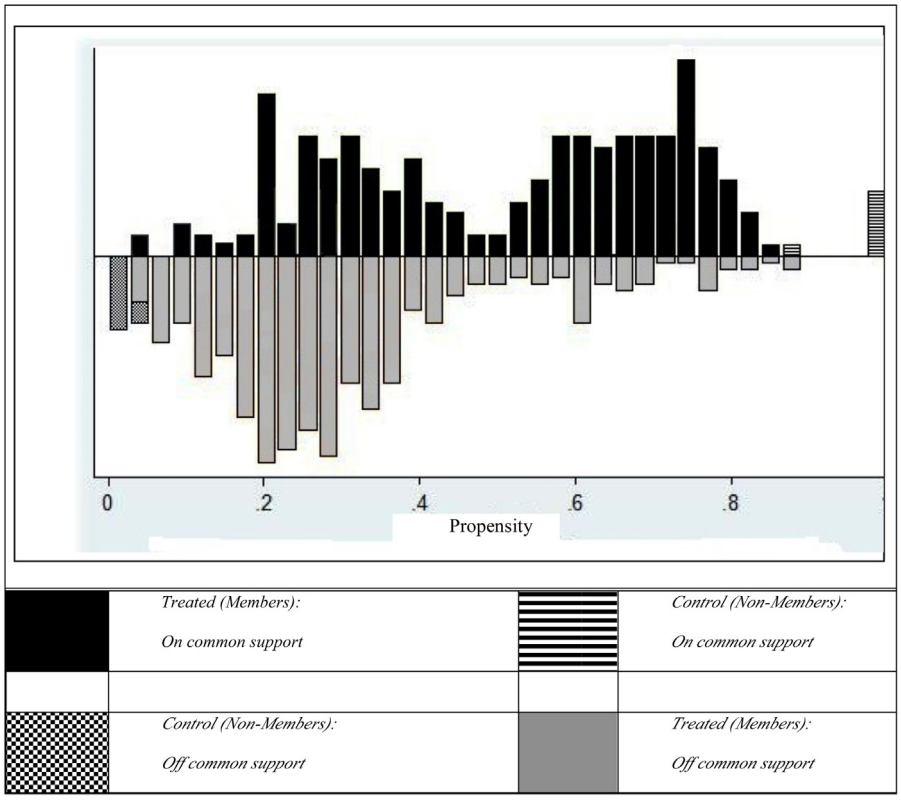

Fig. 1. Distribution of propensity score by treatment groups.

4. Results

4.1. Characterisation of farmer groups

An overview on the investigated farmer groups and their characteristics is given in Table 1.

The different farmer groups were established between 2007 and 2012. The intervention projects supported the farmer groups mainly in the organizational set-up and training. In some cases in-kind subsidies from the project were also provided to the members.

4.1.1. Common interest groups

4.1.1.1. Member set-up. The four CIGs in CB were established in 2009, the nine CIGs in LC and one CIG in HT in 2012.

The average group size of the CIGs in CB, LC and HT varied from 17 to 35 members, except for one CIG in LC with only ten members. The members of the CIGs belonged to different ethnicities. In CB, LC and HT, usually all pig producers in the selected village were members of the CIG. The only two exceptions were one village in Bat Xat (LC), where a small number of farmers belonged to one village, while the overall majority came from a second one. For the Na Cap white pig production CIG in LC, only ten farmers of the village were selected with support of the local authorities based on their poverty status and knowledge in pig production.

Typically, the members of the CIGs were male and female farmers. Due to the particular focus of one project in LC and in HT, respectively, on strengthening women's rights, nine interviewed farmer groups consisted of female members only. In one district in LC, only members of the Women's Union were allowed to join the farmer groups.

4.1.1.2. Management. In all of the three provinces, the leader board was elected during the first meeting of the CIG. In CB, in some cases the leader of the CIG was the village head or vice village head provided that they were experienced in pig production. A few CIGs also had trained 'para-veterinarians', who were in charge of the veterinary drug cabinet. In LC, the candidates for leadership of eight CIGs were pre-selected with the help of OxFam, because they had to fulfil certain criteria such as being literate and able to speak Kinh-Vietnamese. In most cases, at least one member of the leader board was working as a para-veterinarian or village extension officer. The election in one CIG in LC was done with the support of local authorities. In HT, the NGO supported the members during the election of the leader board. In all provinces, the leader board did not receive any payments from the farmer group. Depending on other seasonal activities (harvest, cropping), the CIGs usually met either monthly or bi-monthly.

Under the guidance of the different intervention projects, the farmer groups set up rules and regulations. The rules and regulations were either placed centrally in the cultural house, where regular meetings took place, or a copy was kept by the leader. Due to the high illiteracy rate among the Hmong ethnicity in LC, the leader of these farmer groups read and explained the rules and regulations to his members.

In some farmer groups, the rules and regulations also contained sanctions in case of possible violations (e.g. in CB), or regular monitoring of the pig health condition as well as specific regulations on the replacement and refund of animals received from the project (e.g. in LC). One CIG (Na Cap white pig production group) in LC did not have any rules and regulations.

4.1.1.3. Finance. CIG members sometimes paid fees for food and beverages during the meetings. Mostly, contributions were made to a collective saving fund for subsequent microcredit services. The amount of the payment towards the saving fund varied in the different farmer groups. Members in CB contributed a minimum of 10,000 VND (~0.48 USD) and a maximum of 100,000 VND (~4.76 USD) to the fund, depending on the household situation. In

addition, a membership fee of 2000 VND (0.10 USD) per meeting was charged to cover the meeting costs (e.g. rental fees, beverages)

In LC and HT, member contributions were fixed. The eight CIGs in LC charged an annual amount of 30,000 VND (~1.43 USD), whereas members in HT contributed an annual amount of 50,000 VND (~2.36 USD) to the saving fund. One CIG in LC did not impose any funds or fees.

4.1.1.4. Marketing. The farmer groups in LC and CB mostly raised local black pigs. Only one farmer group in HT and one in LC raised exotic pigs. The members in CB, LC and HT sold their products themselves to traders coming to the village, but exchanged information about market prices with other group members.

Leaders of different farmer groups explained that the marketing was sometimes difficult. Reasons were for example payment of low prices by local traders or price control by market-dominated foreign traders close to the border.

4.1.1.5. Project input. In CB, IFAD provided an empty veterinary drug cabinet to all CIGs. Selected members also received training in pig production, business administration (writing business plans, calculation of saving funds, membership fees) and organizational management (rules and regulations).

In LC, all ten households of one CIG each received in-kind payment from the World Bank, comprising three Large White fattening pigs, 30 kg of commercial feed and 1.4 million VND (~67 USD) cash subsidies to buy corn from the project.

Members of four farmer groups in LC received a black pig (~15 kg) that was selected with the support of the leader board, the communal authorities and the Women's Union. The members of four other farmer groups in LC received up to 1.5 million VND (~70 USD) for ~15 kg black pigs. The farmers could either buy pigs by themselves or keep the money in case they already had one. This approach was used after some members expressed their dissatisfaction with the selection of pigs by the communal authorities and the Women's Union regarding the colour of the black pigs. The farmers wanted a pure black colour, but the skin of the pigs had yellow shades. A revolving fund was established, so that the farmers receiving in-kind payment returned a pig with the same weight (~15 kg) to another member of the group.

In all three provinces, selected members received training to improve their pig production and share their knowledge with the group.

4.1.2. Cooperative groups

4.1.2.1. Member set-up. Nine farmers joined their labour force and capital, and founded the Ly Duc collaborative group in HT. The members were male and female farmers of the Viet-Muong ethnicity.

4.1.2.2. Management. In the beginning, the group had a leader board consisting of one leader, one vice leader and one accountant. After the first sales, the members agreed to reduce the leader board so that only one leader remained. The leader of the group was keeping all the animals on his farm. Each morning three members were assigned to their daily duties.

4.1.2.3. Finance. The group did neither have a saving fund nor paid membership fee.

4.1.2.4. Marketing. The pigs were marketed to local traders. All sales were discussed in the regular meeting. The revenues were distributed to the members according to their work contribution.

4.1.3. Cooperatives

4.1.3.1. Member set-up. The cooperative in HT consisted of eleven group members. The farmer group in Hanoi consisted of 30 members. However, only five members of the farmer group in Hanoi raised pigs, mostly exotics. The other members mainly kept poultry. All members in the cooperative in Hanoi were large-scale farmers.

The members in HT were male and female farmers, whereas only men were members of the cooperative in Hanoi. The ethnicity in both cases was Viet-Muong.

4.1.3.2. Management. A leader board was elected by the members in Hanoi and HT.

The leader board in HT consisted of one leader, two vice leaders (one was also the accountant), one cashier and one inspector. For management reasons, the members wanted to split the group into four subgroups in the future.

In Hanoi, the leader board consisted of one leader, two vice-leaders and two inspectors.

4.1.3.3. Finance. Each member of the cooperative in HT contributed one billion VND (~48,000 USD) to buy land and build four pig stables. The contribution of the commune amounted to 450 million VND (~21,500 USD). The common land area bought for the cooperative was in a more remote area to fulfil new legal environmental requirements.

For the transfer to an officially registered 'new-style cooperative', members in Hanoi needed to contribute a start-up capital of five million VND (~238 USD) each. Additionally, the Vietnamese government supported the cooperative with a grant.

4.1.3.5. Marketing. All pigs in HT were marketed through the cooperative. The sales profit from the exotic pigs was distributed equally to the members. Due to low pig sales prices in 2012, the cooperative was planning to change to cattle production in the future.

In Hanoi, the pigs were partly marketed through the cooperative, partly individually; the marketing decision was left to the farmer. In case the pigs were marketed through the cooperative, 1.5–2% of the total amount went towards the cooperative. At the end of the year, the amount was distributed in the form of salary among the leader board members based on their respective activities.

4.1.4. Contract farming

The Xuan My pig production group in Ha Tinh was registered as a farmer group by the local authorities. Three families joined their land and labour forces in HT, and two members started a contract with the Charoen Pokphand Vietnam Cooperation Group (CP). After one year, three more members followed. The agreement regulated the production standards (pig stable, feed, etc.) according to which the farmers had to raise the pigs received from CP. As is common in contract farming, the farmers received the payment for the fattening pigs subject to the service (e.g. feed, electricity, etc.) provided by CP. The contract duration with CP was three years. One member was not satisfied with the contract and did not want to renew it when the old contract ended due to high investment costs and low pig prices.

4.1.4.1. Impact of projects on income changes as determined by propensity score matching. Table 2 presents the distribution of covariates and outcome variables by treatment (between members and non-members), and the results of the logistic regression that was used to predict the probability of group membership (propensity score). The results show a good distribution of most covariates, except for pig herd size and provision of extension service that are not well balanced. The average size of the pig herds is much larger

Table 2
Distribution of covariates and outcome variables by membership (treatment), and results of logit model.

Variables	Non-member		Member		Logistic regression[a]	
	Number	%	Number	%	Coefficient	P-value
Province						
Cao Bang	60	51.72	56	48.28		
Lao Cai	195	60.94	125	39.06	0.041	0.822
Ha Tinh	90	70.87	37	29.13	−0.710	0.205
Hanoi	10	76.92	3	23.08	−3.309	0.028
Farmland size						
<1 ha	253	62.01	155	37.99		
≥1 ha	102	60.71	66	39.29	0.041	0.782
Ethnic group						
Hmong-Mien	106	58.24	76	41.76		
Tay-Thai	146	58.87	102	41.13	0.125	0.409
Viet-Muong	103	70.55	43	29.45	0.213	0.698
Education						
no education	102	64.56	56	35.44		
primary	75	56.82	57	43.18	0.234	0.167
secondary	124	62.94	73	37.06	0.092	0.609
higher	54	60.67	35	39.33	0.147	0.532
Extension service						
No	263	75.36	86	24.64		
Yes	92	40.53	135	59.47	1.091	0.000
Off-farm income						
No	206	61.49	129	38.51	0.028	0.826
Yes	269	63.59	154	36.41		
Continuous variables	Mean	Std. Dev.	Mean	Std. Dev.		
Age in year	39.83	12.59	38.26	11.34	−0.015	0.013
Family size	4.92	1.47	4.83	1.47	−0.049	0.28
Cattle holdings	1.71	1.60	2.46	6.07	0.071	0.078
Pig holdings	6.87	8.62	28.59	148.75	0.025	0.000
Income in 2009[b]	36107.92	73251.09	43560.81	103224.90	0.000	0.417
Income in 2012[b]	49536.87	134142.30	96690.53	450783.80	na	na

na: income of 2012 was not analysed.
[a] logistic regression was applied on the covariates as basis for the propensity score prediction.
[b] Income in [,000 VND].

for members than for non-members, and the same is true for the provision of extension services.

However, the bias percentages of the variables were generally small and none of them was significant on the success matching test afterwards. The predicted propensity scores suggest that the average probability of being a member of a farmer group was 37% (mean: 0.37, Std. Dev: 0.22). Table 3 shows that between 2009 and 2012 the income of the members had increased by 17,365,110 VND (~827 USD) through the treatment (i.e. being a member of the farmer group). The results also show that the overall annual income of the population would increase by 14,243,700 VND (~678 USD), if farmers participated in the treatment (i.e. being a member of a farmer group/receive project support). By using the combination of kernel matching and DID, the time constant unobserved effects were eliminated. This shows that being a member was linked to an income increase.

The effect of a project (i.e. increase in income of members) was estimated using a general linear model. The average income of members in CB increased to 7,077,250 VND (~337 USD) between 2009 and 2012, whereas the average income of members in LC increased by 22,245,190 VND (~1059 USD) showing that the project (i.e. being a member of a farmer group) had a positive impact on income. However, the average income of members of the CIG in HT only increased by 553,330 VND (~26 USD) over a three-year period (see Table 4).

The pig production farmer groups that were established by seven different projects in selected areas of North and Central Vietnam varied according to their structure and operation as well as their impact on farmers' income.

5. Discussion

In the past, top-down organized, government-owned cooperatives were largely common, while nowadays different types of farmer groups (CIG, CG and cooperative) can be found in Vietnam. Through numerous rural development plans, policies and programmes, ethnic minorities in upland areas are targeted by the Vietnamese government and intervention projects to reduce poverty and to increase agricultural productivity (Phuong & Baulch, 2007). The intervention projects are always attached to the political system. Farmer groups work closely with governmental organizations such as the Women's Union. Leaders and members of farmer groups are connected to the political system in the village, e.g. as a result of being village head or the wife of a village head.

In general, the Vietnamese collectivist value system supports the idea that farmer groups and cooperatives can work sustainably. Previous research suggests that homogeneous groups from similar social networks lead to more cooperative stability (Chatman & Flynn, 2001; Schad, Roessler, Neef, Valle Zárate, & Hoffmann, 2011). The outcome of the present study supports this notion. The satisfaction among members was generally high, with over 90%, except for members of one farmer group in LC, where group members originated from two different villages. Farmers from the smaller group were dissatisfied with the communication between the two villages. Although the member set-up of the farmer groups differed in terms of ethnicity and gender, there is no evidence to show which group set-up could have the highest impact on the sustainability of the group. Different factors, such as member-set up, management or economic aspects, play an important role in the sustainability of

Table 3
Propensity score matching with difference-in-differences calculating the average treatment effect.

Variable	Sample	Treated[a]	Controls[a]	Difference[a]	S.E.[a]	T-stat
Income 2009[a]	Unmatched	39.16	36.00	31.69	6.72	0.47
	ATT	39.16	33.13	60.36	9.17	0.66
	ATU	36.00	36.85	0.86	–	–
	ATE			2.83	–	–
Income 2012[a]	Unmatched	67.00	51.22	15.78	14.11	1.12
	ATT	67.00	43.57	23.43	18.94	1.24
	ATU	51.22	64.61	13.39	–	–
	ATE			17.22	–	–
Income Difference[a]	Unmatched	27.87	15.45	12.43	9.65	1.29
	ATT	27.87	10.51	17.37	12.71	1.37
	ATU	15.45	27.76	12.31	–	–
	ATE			14.24	–	–

[a] Income in million VND [,000.000 VND].

farmer groups. The management varied in all farmer groups from only having one leader to a broader leader board. Additional findings of Schöll, Markemann, and Valle Zárate (2015) suggest that the high satisfaction with the management could be explained by the Vietnamese culture of filial piety and respect to authority. Even though criticizing authorities and elderly people is not customary in Vietnam, members in LC stated to be unsatisfied with the leader board. An implied reason could be unequal treatment, since farmers mentioned that members having relations to the leader board sometimes received in-kind payment sooner than others did. In almost all cases, the project supported the farmer groups in the organizational set-up. Even though the management differed in the 18 farmer groups, it was apparently adapted to the specific situation of the farmer group in most cases. Almost all groups had rules and regulations, usually set up with the help of the intervention projects. However, members were apparently not always aware about the content of the rules and regulation even though they knew that they existed.

The members of a cooperative group in HT had a high level of satisfaction with their membership (84%) and management (100%), because of the positive working environment. Group satisfaction was enhanced by transparency and trust, e.g. all sales were discussed and decisions were collectively agreed upon. The members also had insight into the book keeping. Hansen, Morrow, and Batista (2002) stressed the importance of trust among members in a cooperative.

In all three provinces, the intervention projects had a positive effect on farmer group membership. All members received training from the projects, but only three projects (IFAD/Lux-Dev in Cao Bang, IFAD/GIZ in Ha Tinh, NGO 'Sustainable Rural Development' in Ha Tinh) mainly focused on technical training. The members of farmer groups established with the help of OxFam in Cao Bang received in-kind subsidies, e.g. pigs or the monetary value of a pig, in addition to training and a revolving fund was established. WB supported the farmers with in-kind subsidies in the form of pigs, feed and financial incentives. However, Schöll et al. (2015) showed that farmers assigned reasons for group success to external project interventions, while failures were rather attributed to internal factors. Depending on the projects' approach, members mentioned training or in-kind payments as key reasons for success.

One reason for the higher increase in income in LC could be explained by a better connection to markets in tourist regions (district of Sapa), while farmer groups in CB still struggled with marketing their products at stable prices. The smaller increase in income in HT could have been due to the keeping of exotic pigs and the direct competition of small-scale farmers with bigger farms producing the same products. In contrast, farmers in CB and LC produced black village pigs, mostly in a traditional way, which can be marketed at higher prices (Phuong et al., 2014). Another possibility could be that the farmer group was not yet well connected to the market, since these groups were only recently established in 2012.

We assumed increasing income to be an indicator for the long-term stability of a farmer group. Accordingly, income of group members had increased compared to non-members and thus, the intervention project could be considered a success, either in linking farmers to the market or in opening up new marketing potentials. An increase in income in the long run would improve the livelihood of the farmers, as for example the farmers mentioned to use the income generated from the pig sales among others to build a new house, to expand their farm by procuring additional land or to buy vehicles. Paying back loans and debts, purchasing school books or paying for the education of their children as well as buying fertilizer and corn to produce higher yields were also stated as expenditures from higher income. Thus, increased income was partially re-invested, which makes sustainability of the intervention promising. However, long-term effects on wealth cannot be predicted with the methodology applied, but would require a long-term impact analysis. A farmer group can only sustainably exist, if it is able to cope with changes in external circumstances adversely affecting farmers, e.g. by changing customer preferences, consumption patterns, or external support. Neef and Neubert (2011) suggested that in some cases it might be advisable to work with farmers, who are in the position to change some of their practises and are better able to cope with income losses.

More recently, Vietnam was hit by several outbreaks of animal diseases resulting in customers reducing their pork consumption (Lapar, 2012), hence particularly threatening smallholder pig production. A continued support of the Vietnamese government for the establishment of farmer groups and cooperatives would likewise contribute to sustainability and stability. Bachke (2014) pointed out that most of the farmer groups in Mozambique, similar to Vietnam, were created with the support of an intervention project and stopped functioning after the project support ended. Reasons for non-sustainability were, among others, weak financial efficiency due to low membership fees, high illiteracy rate of the members and a high amount of free-riders. Yet, evidence from Rwanda showed that there was no difference in the performance of top-down compared to bottom-up initiated cooperatives (Verhofstadt & Maertens, 2014).

Bromwich and Saunders (2012) evaluated four new-style cooperatives in China, whose formations were supported by an intervention project and showed an increase in income for farmers. Even though Vietnam and China are considered to have similar political systems, one must be careful to compare those findings as the cooperative development in China and Vietnam differs. The new-style rural cooperative in China allowed households to voluntarily join democratic community-based organizations, similar to Vietnam, but members in China are shareholders whereas this is not the case for Vietnam.

Table 4
Project effects on the income differences among farmer groups (matched data).

Province (Projects)	Group category	No of members	Income difference (2012–2009)[c]	Least Squares Means[a]							
			Mean [in,000 VND]	Cao Bang (IFAD)	Lao Cai (OxFam)	Lao Cai (Worldbank)	Ha Tinh (IFAD, GIZ)	Hanoi (Vietn. Governemnt)	Ha Tinh (SRD)	Ha Tinh (CP)
Cao Bang (IFAD, LuxDev)	CIG	61	7,077.25		0.7727	0.0037	0.9345	<.0001	0.9302	0.9724
Lao Cai (OxFam)	CIG	120	22,245.19	0.7727		0.0042	0.8473	<.0001	0.7503	0.9659
Lao Cai (Worldbank)	CIG	9[a]	355,867.78	0.0037	0.0042		0.0414	<.0001	0.0055	0.1254
Ha Tinh (IFAD/GIZ)	Cooperative	6[b]	–4,658.33	0.9345	0.8473	0.0414		<.0001	0.9722	0.9373
Hanoi (Viet. Gov't)	Cooperative	3[b]	1,239,486.67	<.0001	<.0001	<.0001	<.0001		<.0001	<.0001
Ha Tinh (SRD)[c]	CG + CIG	30	553.33	0.9302	0.7503	0.0055	0.9722	<.0001		0.9473
Ha Tinh (CP)	Contract farming	3[b]	13,906.67	0.9724	0.9659	0.1254	0.9373	<.0001	0.9473	

$p < 0.05$ show significant effects of a project over another on income difference.
[a] For effect of the project Pr > |t| for H0: LSMean(i) = LSMean(j), Dependent Variable: income difference.
[b] Numbers of observations are too small to make a comparison.
[c] (i) Cooperative group and common interest group was set-up by the same project, (ii) income in [,000 VND].

Furthermore, the studies in China mainly referred to rural or industrial cooperatives, but did not focus on farmer groups with ethnic minorities. This might be for various reasons, as for example ethnic minorities often live in upland areas or close to borders, both topics which the government regarded as sensitive or problematic (Bonnin, 2010; Svensson, 2006), severely restricting research permissions.

We hypothesized that top-down organized cooperatives often lack sustainability, because they need to be build according to the principles of self-help, self-administration and self-responsibility (DGRV, 2014) and that members of a farmer group would gain better access to services (e.g. training, market access), which would lead to an increase in their income. From our findings we can conclude that intervention projects support farmers in gaining access to services and are thus in a position to increase their income. Supporting farmer groups through project intervention could therefore be an efficient way to reduce poverty among farmers. However, we are not able to draw conclusions on the lack of sustainability of top-down farmer groups after the project intervention, because all projects were either still running or just finished few months ago. It would be important to take a closer look at the long-term sustainability of farmer groups after project completion. Future research should also focus on long-term changes in livelihoods of farmers and their families due to farmer group membership. Other limitations of the present study relate to some factors that were not measured such as social effects or values, e.g. health, women rights or higher education of children. Future research could also prioritize welfare indicators to analyse the impact of farmer groups on the well-being of farm households.

6. Conclusions

The aim of this study was to assess the impact of projects initiating group marketing of smallholder pig farmers in Northern and Central Vietnam. We found that intervention projects have an impact on the income of farmer groups and thus could be considered a success in either linking farmers to the market, or in opening up new marketing potentials.

Although training was a tool used by every project, we found a great variety of approaches of intervention projects on supporting the establishment of farmer groups. Yet, further research needs to be done to determine the reasons for this success and exclude factors which are not associated with the intervention projects.

Although the results suggested that farmers are either linked to the market or have new marketing potentials, most members still market their products individually. However, the members exchange information about market prices with other group members.

Limitations of the present study relate to a relatively small sample size and some factors that could not be measured. It would be important to take a closer look at the long-term sustainability of farmer groups after the project support ends.

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Appendix A.

See Table A1

Table A1
Assessment of the propensity score matching quality using pstest.

Variable	Unmatched		Matched		%Bias	P-value
	Treated	Control	Treated	Control		
2. province (Lao Cai)	0.56	0.62	0.57	0.61	−7.1	0.461
3. province (Ha Tinh)	0.17	0.15	0.15	0.15	0.1	0.989
4. province (Hanoi)	0.01	0.00	0.00	0.00	6.4	0.439
Land	1.30	1.23	1.29	1.24	12.1	0.197
2.ethnic	0.46	0.45	0.47	0.44	6.5	0.506
3.ethnic	0.20	0.17	0.17	0.18	−0.6	0.947
Primary education	0.26	0.33	0.27	0.31	−9	0.382
Secondary education	0.33	0.33	0.33	0.34	−1.1	0.911
Tertial education	0.16	0.13	0.15	0.13	4.9	0.601
Extension	0.61	0.65	0.62	0.64	−4.1	0.690
Off-farm income	0.56	0.59	0.56	0.58	−5.1	0.602
Age	38.04	37.73	37.62	38.13	−4.5	0.629
Family size	4.84	4.68	4.85	4.66	13	0.158
Cattle	2.35	1.86	1.95	1.88	4.2	0.667
Pig	28.42	7.96	8.68	7.40	9.8	0.320
Income 2009	44319.00	36388.00	38997.00	37153.00	2.4	0.805
Pseudo R2	LR Chi2	p > Chi2				
0.019	11.19	0.798				

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