Some notes on using a value chain approach to estimate the economic impacts of oil palm expansion in the territories

Breves notas sobre el uso del enfoque de cadenas productivas para estimar impactos económicos de la expansión de la palma africana en los territorios

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ABSTRACT

This short article explains a method already used by the author in the case of Guatemala to estimate the economic consequences of land use changes driven by oil palm plantations. The innovative method accounts not only for the direct land use change outcomes, but also the impacts on forward and backward sectors of the agricultural activities and allows for sub-national estimations, using territorial input-output-matrices. Therefore, it is suggested that this method be applied also in the case of Colombia. This would allow highlighting differences and probably also some commonalities with respect to the characteristics of the expansion of this flex crop.

KEYWORDS: value chains; monocultures; oil palm; forward and backward linkages; input-output analysis.

RESUMEN

Este artículo corto explica un método ya utilizado por el autor en el caso de Guatemala para estimar las consecuencias económicas de los cambios en el uso del suelo causados por las plantaciones de palma aceitera. Este método innovador da cuenta no solo de los resultados del cambio directo en el uso del suelo, sino también de los impactos en los sectores hacia adelante y hacia atrás de las actividades agrícolas y permite realizar estimaciones sub-nacionales, utilizando matrices territoriales de insumo-producto. Por lo tanto, se sugiere que este método se aplique también en el caso de Colombia. Esto permitiría resaltar las diferencias y probablemente también los puntos en común con respecto a las características de la expansión de este cultivo flexible.

PALABRAS CLAVE: cadenas de valor; mono-culturas; palma de aceite; encadenamientos hacia adelante y hacia atrás; análisis insumo-producto.

Introduction

Oil palm plantations are expanding worldwide; for example, in Colombia, the largest producer in Latin America, the size of these monocultures has nearly tripled from 158 thousand ha in 2000 to 466 thousand ha in 2015 (Fedepalma, 2016). The socio-economic consequences of this development vary according to the country and regional context, and various actors on different levels might benefit or lose with the expansion of plantations. For example, additional employment may be created for rural laborers, some smallholder farmers might participate as suppliers for palm oil factories while others may even lose their land. Further, there might be still other actors that get affected, but which are often not taken into consideration, such as the local agro-chemical shop that might lose clients because palm producers buy fertilizers directly from (inter-) national companies. Regional maize traders may also have less produce to purchase, and therefore, less sales and income if land dedicated to maize was substituted by oil palms.

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The selection of these examples is not random. Rather the purpose is to illustrate that, in our view, two basic factors will influence the socio-economic outcome of the plantation expansion: the type of direct land use change which is taking place, and the type of value chains which are replaced or reconfigured. Therefore, in this short paper we want to propose a relatively simple method to estimate the economic impacts of oil palm plantations on a territorial level. Our approach is based on a method developed by Costa (2012), which uses a value chain approach combined with input-output analysis to develop a sub-national, agrarian-based social accounting system. Economic impact here is understood as value created (or destroyed) and then (re-) distributed or (re-) concentrated; and territory as a certain sub-national or even sub-regional level where certain economic activities and circuits are located, which are directly affected by the change to oil palm plantations. After a short explanation of the method, we give an example of its application to the northern lowlands of Guatemala, then examine the potential benefits of using this methodology in the case of Colombia, and finally finish with some remarks on further research needs.

Methodology

We start by three basic suppositions. First, it makes a difference where the oil palms are planted: is it on cleared forests, on grassland, on agricultural land? In other words, we have to study which type of crops or economic activities the plantations substitute (if any) i.e., the direct land use changes. Second, it is not only the direct substitution which has to be considered, but also the indirect effects of the initial change on other sectors of the economy, mainly on forward and backward sectors of the agricultural sector (input industry, agricultural trade, agro-processing etc.). In other words, we have to investigate the value chains on the territorial as well as on a national level. Third, the value created on a territorial level is not necessarily the same as the value distributed on this level. This implies that part of this value can be transferred to the national (or even international) level.

Costa (2012) developed a methodology of an agrarian-based social accounting system, using value chains as the basis of an economy of k agricultural products and n (agricultural, industrial and service) sectors in a given political–administrative or geographical unit. The idea behind this method is that the agrarian-based value added (or GDP) can be calculated as the aggregate result of the formation of supply and income associated with each of the k products and n sectors of the agricultural value chains that comprise it, using input-output-tables to visualize the main variables (output, intermediate and final demand, value added composition). The agrarian-based social accounting system consists of a computation algorithm for obtaining the values Xij of the input–output matrix. Each Xij of the system is a result of the multiplication of the amount q of product transacted between the sector i with sector j by price p, so that

$$Xij = qij * pij \quad (1)$$

By summing up all the interactions of the n agents or sectors with k products, plus their selling of k products to the final consumer, the total output of the system can be calculated:

$$X = \Sigma Xv = \Sigma Xi = \Sigma\Sigma DFvi + \Sigma\Sigma\Sigma Xvij$$
$$\text{for } i,j = 1 \text{ to } n;\ v = 1 \text{ to } k \quad (2)$$

(where Xv: total output of product v, Xi: total output of sector i; $DFvi$: final demand of product v delivered by sector i, $Xvij$: intermediate demand of sector j from sector i of product v).

The structure of the value chains is determined by studying local agriculture, then following its linkages through the different (geographical) levels and sectors until the final consumer is reached (the "ascending" or "bottom-up approach"). In this process, the transactions of the non-agricultural sectors are investigated from the local to the national level. For each product and sector, a computable equilibrium is established by equalizing the amounts of supply and demand (Costa, 2012).

This means that the primary data show the structure of the value chains using input-output-tables, i.e., the value of inter-sectoral and final demand,

total input and output per sector, and the sectoral value added (divided between salaries and profits) and employment generation. As these primary data normally do not include all the intermediaries active in a certain territory, it is necessary to merge this information with official statistical data of total agricultural output by multiplying the matrix with an expansion factor (total output derived from census data divided by investigated output derived from interview data). This leads to an input-output table which should reflect the whole agricultural value chains of the studied territory, assuming that the primary data derived from interviews with intermediaries can be linearly extended to the whole agricultural sector of the territory and to the national level, in other words: that the other intermediaries which were not interviewed follow the same input-output structure (Dürr, 2017).

For our purpose, and based on the input-output-tables created, one can estimate how much value added is generated by the palm oil sector and its supplier and user industries at the territorial as well as the national level. These amounts can be further related to one hectare of oil palm plantation. The same procedure can be used to study other value chains which have been or will be (partly) substituted by oil palms, and relate them also to one hectare of land. This way, we will be able to compare the value added and employment generated in the whole value chains instead of only looking at the agricultural sector. We will also be able to see what happens to each of the sectors involved in the chains, meaning how much of its jobs and incomes will be affected. We can also estimate if the value created by these sectors is likely to contribute to the territorial economy, or if it is more likely to be transferred to sectors outside the territory.

Results for Guatemala

In our study on oil palm (and sugar cane) expansion in Guatemala (Dürr, 2017), we used data from Alonso-Fradejas et al. (2011) for the northern lowlands of both the actual land-use changes between 2005 and 2010, as well as the total potential for oil palm plantations. The expansion 2005-2010 reached 50,707 ha, of which 64% were formerly forest and shrub areas, 20% basic grains and 12% pastures. The greatest expansion opportunities (288 thousand ha or 65%) are also offered by forest and shrub areas, whereas areas planted with basic grains (mainly corn) have a potential of 63 thousand hectares (14%) and pastures of more than 65 thousand ha (15%). In addition, more than 18 thousand hectares of coffee and cardamom plantations would be suitable for oil palms (4%).

Based on our own surveys and official census data on agricultural production volumes and areas, we estimated an agricultural value added (VA) of oil palms of US$1,397/ha, higher than that of corn (US$482/ha) and livestock (US$260/ha), but lower compared to cardamom (US$2,370/ha) and coffee (US$1,481/ha). Considering the entire value chain, the palm oil sector generates the highest territorial VA of US$3,481/ha, compared to cardamom (US$3,458/ha), coffee (US$2,284), corn (US$802/ha) and livestock (US$385/ha). This is due to the fact that the transformation of palm fruits to crude palm oil takes place in the territory, adding much value to the product. Taking into account these figures, the territorial economy should benefit from the substitution of all crops by oil palms (Dürr, 2017).

However, this picture changes when we assume that the palm oil companies transfer their profits out of the territory and that only the wages and salaries paid remain as part of the territorial value added. This assumption is justified by the fact that the palm oil agribusinesses "redirect land-based wealth from the local (cultivating) territory toward distant, non-cultivating classes (national oligarchy and international hubs of financialised capital)" (Alonso-Fradejas 2012, p. 517). Therefore, we used the concept of gross national product (GNP), since it corrects gross domestic product (GDP) for the net transfers of residents to non-residents, so that only the income of residents of the territory is taken into account in the measurement. Taking into account only the salaries of the employees as a proxy for territorial GNP, oil palm generates US$471/ha, the second lowest value after livestock. An expansion of oil palm plantations would not benefit the territorial economy, because more value per unit of land is generated and distributed between territorial economic actors in the value chains of corn, coffee

and cardamom. Livestock is the only sector whose contributions to territorial GNP is less than that of oil palms. A total substitution of all potential land with oil palms would therefore result in a loss of US$35 million for the economy of the northern lowlands (Dürr, 2017).

Moreover, the actors which benefit from the value chains are very different- the profits generated in the vertically integrated oil palm value chain accrue to national and transnational corporate-owned firms. In contrast, value chains of corn, cardamom and coffee create employment and income mainly for poor smallholders as well as for petty traders and small to medium processors. This means that income will become probably less equally distributed by the monocultures' expansions (Dürr, 2017).

Potential benefits of using the methodology in Colombia

In the case of Colombia it seems that the land cover change to oil palm between 2002 and 2008 occurred, in contrast to the northern lowlands of Guatemala, mainly on pastures (51%) and croplands (29%), and less on natural vegetation (16%) (Castiblanco et al., 2013). The authors also calculate probable future expansion scenarios in different areas of Colombia - in total, 49% of oil palm plantations will replace pasture areas, 19% heterogeneous agricultural areas, and 13% natural vegetation areas. As in the case of Guatemala, the economic effect of the substitution of grasslands for oil palm plantations will probably be positive, given the low-intensive type of cattle grazing on vast pastures, an activity which offers marginal employment and income per hectare. Nevertheless, for the expected expansion on 6,750 ha of rice in the eastern zone and 22,200 ha of banana in the northern zone, the economic consequences for these regions will be different and might be negative, given the labor-intensive production of rice and banana and the amount of income which is generated in the agricultural as well as non-agricultural sectors (rice mills, wholesalers, retailers etc.) of the territories.

In Colombia, the employment in the palm oil sector is generating income mostly for local inhabitants (77% of total employees) so that one could conclude that much value added stays within the territories. DANE (2018) estimated that the 67,672 employees in the palm oil sector were earning on average around 990 thousand Colombian pesos (US$334) per month in 2016. This means that the total amount of annual income was around US$ 271 million, produced on 512,076 ha, which results in US$529/ha, which is not so different from our estimates for Guatemala (US$471/ha). The big question then is which portion of the profits of the palm sector stays on the territorial level and how much is transferred to the (inter-) national level.

Another interesting application of our method would be to link it to the simulation of outcomes of the expansion of oil-palm agriculture in Colombia on the production capacity losses of other crops as done by García-Ulloa et al. (2012). The loss of rice and maize production of between 0.03 and 3.00 million tons (of a total production of 4.1 million tons), depending on the scenario, could then be expanded to the rice and maize value chains of the territories, and the loss of income and employment in these chains could be compared to the respective gains in the palm oil value chain.

Conclusions

For the analysis of the socioeconomic implications of the different types of land-use changes which can be observed worldwide (Borras and Franco, 2011) the method proposed here seems to be a promising approach. Therefore, it would be interesting to apply this method to the case of Colombia and other Latin American countries. This would allow highlighting differences, but probably also some common characteristics of the expansion of this flex crop. Differences in land use changes can be observed between Latin American countries and even within countries. For example, land use changes in Colombia seem to be more focused on pastures than in the case of Guatemala (Furumo and Aide, 2017) so that beef and milk value chains will rather be affected than, for example, the maize value chain. To estimate the impacts, these value chains will have to be analyzed in terms of income and employment generation.

However, we cannot deny that the method applied so far has some inherent limitations. First of all, our approach is definitely a comparative-static one and does not include dynamic impacts, which might become apparent only long after plantation investment has taken place (Cotula et al., 2014). Thus, more sophisticated research approaches on the dynamics of the territorial economies are necessary. Second, we only consider the production side of the value chains and not the consumption side. By using territorial Social Accounting Matrices (SAM) it would also be possible to estimate the consumption effects, which were excluded from our study. Detailed SAM would also allow for a more disaggregated analysis of gains and losses for different socio-economic groups. Third, the estimation of the impact of investments on the territorial economy was not included in our analysis. Fourth, better information on the use and transfer of profits of the oil palm companies, which is certainly not easy to get, could further enhance the estimation of benefits for the territory. Fifth, our approach ignores labor market effects on wages as well as land market effects. Sixth, indirect land use changes were also not considered. Last but not least, we did not estimate the value of forest products (actual, potential) or the value of forest ecosystem services and other values of forests which might exceed their pure economic value by far.

Conflict of interests. The manuscript was prepared and reviewed by the author, who declares that there exists no conflict of interest that puts the validity of the presented results at risk.

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