



Social and Technological Transformation of Farming Systems: Diverging and Converging Pathways

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Workshop 5.5: Value chain research and development – approaches for diverse farming systems

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The value chain perspective has been gaining strong momentum within the last decade – both in research and in development cooperation. Hopes have been raised that the system view which underlies value chain analysis and related approaches would lead to more effective development interventions, in particular in developing countries. In parallel to the growing body of scientific publications, a variety of manuals have been elaborated which offer to guide different actors in efforts to analyse, upgrade and develop value chains, in particular for agricultural products. At the same time, the complexity of the approach poses significant challenges for the actors involved. Whereas research on value chains may have various different focal points, the approach is used in development projects mainly with the objective of integrating smallholders and/or poor rural population groups into highly coordinated, often international value chains. Typically a crop is selected by the project following certain criteria, then attempts are made to establish or improve the value chain from producers to end buyers through a variety of measures including public-private partnerships. However, this integration of smallholders in global value chains is discussed controversially*, in particular regarding the role of smallholder farming systems and agro-biodiversity. The attempt to integrate smallholders into specific global value chains is perceived as forcing them to subordinate themselves to global market structures and to support non-sustainable production and trade patterns. Smaller actors may have less power to influence the governance of such chains, and forming cooperatives is not always the best remedy.

Within the broad range of perspectives on value chain upgrading and development, we explored in the workshop concepts and examples for more inclusive value chains, in particular regarding (smallholder) farming systems, power relations and governance, gender and youth, job creation and environmental sustainability:

- 1) How may value chain analysis and development approaches be designed so that they support a variety of actors in and around the chains in making their own strategic decisions?
- 2) What is necessary so that value chains and their governance become more inclusive and sustainable, and how will we know that such changes have really happened?
- 3) How may concepts stay manageable for actors while the system view is maintained in its complexity?
- 4) How can researchers, and practitioners and policy-makers, meaningfully collaborate in such activities?

In Europe, value chain approaches often focus on competitiveness and efficiency as dominant paradigms – under which chains compete with each other and large specialised farms in highly co-ordinated value chains appear to be more successful than other systems. European and national policy-making is often incoherent in their support strategies for locally diversified rural development on the one hand and promoting structural change and international competitiveness on the other. Whereas “small” is not always more “beautiful” and large-scale value chains are not necessarily unsustainable, we think that a certain robustness in strategies - oriented towards greater resilience of agricultural enterprises - gains importance in both small

and large scale system types. In this context we welcomed contributions which addressed the following questions:

5) How may value chain approaches support small and large actors in strategic decision-making which is oriented towards long-term resilience of farming and value chain systems as much as towards competitiveness? How is this expressed in the governance of value chains?

6) How do researchers position themselves, whose interests do they focus on in this context?

7) Which objectives and design may value chain research and policies have if oriented towards supporting small-scale farmers in Europe?

We looked for examples of contributions which might give answers to some of these questions – and for new questions which might arise from the discussion and from practice. It was expected that contributions would range from examples for sustainable and inclusive local and global value chain systems (and approaches to their analysis and development), to elaborations on the role of researchers and policy-makers in these processes.

* (e.g. Salazar, 2012; La Via Campesina, 2011 and 2014; Clausing, 2014)

Market quality gradients in smallholder dairy farming systems: how spatial factors affect smallholder production and marketing strategies in the East African highlands. Conceptual framework paper

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Abstract: Market integration of smallholder farmers is seen as an important pathway to secure food supply to growing urban markets in developing countries. However, there is still the question of under which conditions such market integration can effectively emerge. Adequate configurations for input supply, output marketing, and service provision are required to foster market orientation, in which increased utilisation of external inputs and services leads to intensification of production. This paper describes the conceptual basis and set-up of research that is currently being carried out in selected study areas in Ethiopia and Kenya. The conceptual framework considers spatial distribution of dairy farming systems and quality of in- and output markets as factors determining the market orientation of dairy farming. The proposed analytical framework looks at smallholder dairy farming systems, especially farmers' production and marketing strategies, as being influenced by spatial factors in farm assets, in- and output markets, end markets, and context. The research setup uses double market quality gradients that denote proximity to urban centres and proximity to service centres.

Keywords: Smallholder dairy, farm typology, market quality, sustainable intensification, proximity, East Africa

Introduction

Market integration of smallholder farmers is seen as an important pathway to secure food supply to growing urban markets in developing countries (Reardon et al., 2014). With increasing pressure on land area following population growth it is essential to focus on improving productivity per unit of land (Akinlade et al., 2016). Relatively intensive modes of production and stronger market participation may provide alternative pathways to better livelihoods for smallholder farmers, especially in agricultural areas close to urban centres (Akinlade et al., 2016; Duncan et al., 2013). Intensification of dairy production goes hand in hand with increased utilisation of external inputs and services, with the aim of growth in marketable surplus (Barrett et al., 2012). This commercialisation of production results in a growing proportion of produce being sold and usually leads to farm specialisation; it requires increasing market orientation, market participation and farmer business skills (Akinlade et al., 2016; Udo et al., 2011).

Duncan et al. (2013) showed that market orientation of dairy farming systems depends on market quality. They used the term 'market quality' as shorthand for the reliability and attractiveness of systems for milk procurement and for the delivery of inputs such as improved feed, veterinary care, improved breeding services and credit. They further noted that in many cases market quality refers not just to physical infrastructure but also to the institutional arrangements around milk procurement and input supply.

Various authors indicate that in smallholder farming systems, factors that influence greater market participation are not only found at production level, but also on the levels of access to markets and of consumer demand (e.g. Omiti et al., 2006; Poulton et al., 2010; Somda et al., 2005). This complex of factors affect farmers' decisions on production strategies concerning breeding, feeding, husbandry and external input levels, as well as on marketing strategies regarding products, volumes and market channels (Barrett, 2008; Barrett et al., 2012; Duncan et al., 2013; Gebremedhin & Jaleta, 2010; Udo et al., 2011). Coupled with the diversity in farmer decision making stemming from diverse attitudes, behaviour, and orientation, understanding of locality and particularity is important to understand the diversity in how farmers deal with the risks associated with commercialisation (Poole et al., 2013).

Literature about commercialisation and intensification of mixed smallholder dairy farming systems uses various methodologies to compare dairy farming systems (van de Steeg et al., 2010) and to explore the relative importance of the multitude of socio-economic and biophysical factors that influence smallholder production and marketing strategies (e.g. Gebremedhin & Jaleta, 2010). Statistical and econometric methods used include factor analysis, cluster analysis, and principal component analysis, sometimes augmented by classification tree methods and expert-based classification rules (van de Steeg et al., 2010). Modelling of farming systems and market orientation levels is confounded by the large number of factors that determine the variety in production and marketing strategies involved (Groot et al., 2012).

This research aims to reduce the gap in systematic research on the comparative analysis of dairy farming systems from a market quality perspective, as identified by Duncan et al. (2013). To combine analysis of spatial distribution of dairy farming systems, quality of in- and output markets, and market orientation, the present paper analyses how spatial factors influence the interaction between dairy farming and marketing systems, particularly in i) the configuration of service support systems and ii) farmer decisions on utilisation of the same in their production and marketing strategies. Increased understanding of these relationships is essential for design of in- and output marketing systems that can adequately support smallholders at different distances from urban centres (i.e. access to important end markets) and at different distances from main roads (i.e. access to input and service supply centres). What makes this research unique is its connection between farm typology and in- and output marketing as well as its distinction of proximity to in- and output market linkages of farming systems in two categories: 'travel time from service centre in a dairy farming location to urban centre'; and 'travel time from dairy farm to service centre'.

This paper describes the conceptual basis for a spatial framework for analysis of the influence of market quality on dairy farming systems, as well as the set-up for field research to test that framework using purposive sampling. This field research is currently being carried out in selected study areas in Ethiopia and Kenya.

Conceptual framework

This section describes key concepts to do with spatial distribution of dairy farming systems: market orientation of dairy farms, proximity to in- and output markets, and quality and configuration of input- and service provision. It concludes with a presentation of the analytical framework for this research.

Production and marketing strategies in farming systems

Dairy farming system types are the consequence of agro-ecology and degree of market orientation (Pingali & Rosegrant, 1995; van de Steeg et al., 2010), both of which have strong spatial aspects. For farming systems we follow the definition of (van de Steeg et al., 2010), “a population of individual farm systems that have broadly similar resource bases, enterprise patterns, household livelihoods and constraints, and for which similar development strategies and interventions would be appropriate”. Rather than looking at these as static and ‘given’, we recognise agency of farmers in actively pursuing production and marketing strategies that develop their farming system in a certain direction (van der Ploeg, 2008). A farmer’s choices cumulatively result in that farmer’s production and marketing strategies and the latter are influenced by the farmer’s objectives, farm household assets, market opportunities and context variables (Poulton et al., 2010; Udo et al., 2011).

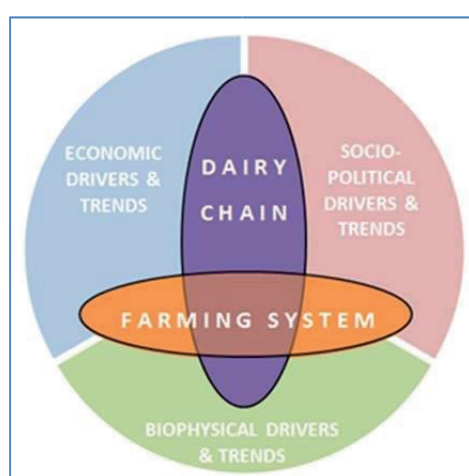


Figure 1. Five lenses for analysis of dairy farming systems (van der Lee et al., 2014)

To understand the production and marketing strategies within smallholder dairy farms and the reasons behind them, it thus is important to look at the farming system in relationship to the dairy value chain (primarily the connections to input, output and end markets relevant to dairy) and to economic, socio-political and biophysical context drivers and trends (Moll et al., 2007; van der Lee et al., 2014), as illustrated in Figure 1.

Proximity of farms to in- and output markets

Effects of distance to urban centres on farmer production and marketing strategies have been described by various authors and literature dates back to von Thunen (1875). Milk as fresh liquid product requires proximity to output markets, which explains peri-urban market-oriented dairy farming at close proximity to cities. On the other hand, milk production requires ample space for production of fodder and feeds, which may be scarce in peri-urban areas. In remote areas where this space is available, marketing of milk to the urban centre is a challenge. As milk cannot be transported across large distances without cooled transport, remote farmers more often produce and sell butter and cheese (Gebremedhin et al., 2014; Voors & D’Haese, 2010). Moreover, effective market linkages are needed to escape an autarkic market situation (Barrett, 2008). Shifts in technology, such as the introduction of ultra-high temperature (UHT) milk treatment in the 1990s, allowed expansion of milk production at huge distances from

urban centres where it was not possible earlier (Novo et al., 2013). Farmers who are physically close to urban markets may have the choice between direct marketing of raw milk and delivery to industrial processors. For farmers in remote areas the opportunity for direct marketing usually is much more limited and depends largely on the geographic density of dairy cows as compared to density of rural consumers. For example, in Nyandarua County, Kenya, local marketing options are very limited as nearly all farm households keep one or more dairy cows to satisfy at least their own household consumption needs.

Remoteness and proximity are relative terms that are influenced by quality of infrastructure like roads, electricity and telecom connectivity (Hoddinott et al., 2014; Kyeyamwa et al., 2008; Mutambara et al., 2013) and by agro-ecological factors like mountain areas and aridity (Reardon et al., 2014). We prefer 'travel time to market' as an indicator for proximity over 'distance', as it denotes transaction costs in terms of time and transportation. Travel time can be influenced by road improvement, new means of transport and collective action for bulking milk along roads, and by making use of milk cooling technologies (Gebremedhin et al., 2014).

At the local level, the need for daily transport of milk to milk collection centres (MCC) makes year round access to all-weather roads (distance, travel time, mode of transport) and travel time to MCCs (density of milk collection grid, road conditions) important parameters for farmers when considering supply to liquid milk markets, be it to the 'industrial chain' for pasteurized and extended shelf life dairy products or to the 'traders chain' for raw milk (Muriuki & Thorpe, 2006; Voors & D'Haese, 2010). The suggested distinction by Gebremedhin et al. (2014) between farming 'near consumption centres', 'along the all-weather road', and 'remote' is particularly helpful as basis for a typology of farming systems based on proximity, but so far has not been validated with field studies.

Next to output marketing, proximity also affects marketing of external inputs and services to farmers, which is associated with differences in external input use between hinterland and non-hinterland areas (Reardon et al., 2014). According to Voors & D'Haese (2010) remote farmers face high transaction costs to reach input markets. Due to the small volumes, "last mile delivery" of inputs and services to the farm gate is relatively the most expensive part of the distribution chain, particularly in remote areas. Travel time to input market is one of the factors that increase transaction costs, next to asset specificity and uncertainty surrounding the transaction; proximity reduces not only transport costs but also other transaction costs: information gathering may be easier, negotiation more frequent, and monitoring less costly (Shiferaw et al., 2006; Voors & D'Haese, 2010).

Market quality and support system configuration for input- and service provision

Various studies have shown how limitations in market access negatively affect farmers' market participation and market orientation (Akinlade et al., 2016; Barrett et al., 2012; Gebremedhin & Jaleta, 2010; Omiti et al., 2006). Smallholder decisions on intensifying dairy production that require investments in e.g. better feeds and higher-yielding animals are depending on the proximity of such services (Duncan et al., 2013), which is associated with quality, price, and reliability of supply. On the other hand, supply of inputs and services is dependent on farmer demand and a gradual development of demand and supply can be expected (Jaleta et al., 2013). Remoteness results in reduction of both demand and supply of production inputs and services (Mutambara et al., 2013). By way of illustration, Table 1 portrays the resulting ranges of input and service options available to smallholders depending on proximity.

Table 1. Inputs and services options available to smallholder dairy farmers for extremes in market access

Input/Service	(Peri-)urban	Remote
Breeding	AI	Bull service
Animal health	Veterinary services, industrial drugs.	Community-based animal health workers, use of traditional medicines
Feed supplements	Commercial feeds, by-products, silage	Crop residues
Equipment	Industrial	Artisanal
Fertilisers & pesticides	Chemical	Organic
Financial services	Financial institutions	Community, traders
Farm advice	Public and private service	Community-based
Milk marketing products	Processing plant collection, direct marketing	Local milk sales, home-processed products

Effective and cost-efficient supply of inputs and services to farmers requires proper coordination mechanisms for cost-effective and adequate delivery. Such mechanisms may include geographic clustering of input supply and service provision, packaging of services, or connection of input and service provision to output marketing through vertical integration (Jaleta et al., 2013; Poulton et al., 2010).

Analytical framework

Based on the above we propose a spatial framework for analysis of influence of market quality on dairy farming systems. This analytical framework, as portrayed in Figure 2, looks at smallholder dairy farming systems as being influenced by factors from the input market, farm resources, output market and end market. It builds on Somda et al. (2005) and Reardon et al. (2015) who classify factors that influence greater market participation of smallholders.

In this analytical framework we focus on spatial factors and those factors that can be expected to be influenced by them. These were selected from the wide range of factors described for different crops and livestock products by various authors (Akinlade et al., 2016; Bahta & Malope, 2014; Barrett et al., 2012; Gebremedhin & Jaleta, 2010; Moll et al., 2007; Mugisha et al., 2014; Mutambara et al., 2013; Omiti et al., 2006; Reardon et al., 2014; Somda et al., 2005; Udo et al., 2011; van de Steeg et al., 2010; van Melle et al., 2013; Voors & D’Haese, 2010).

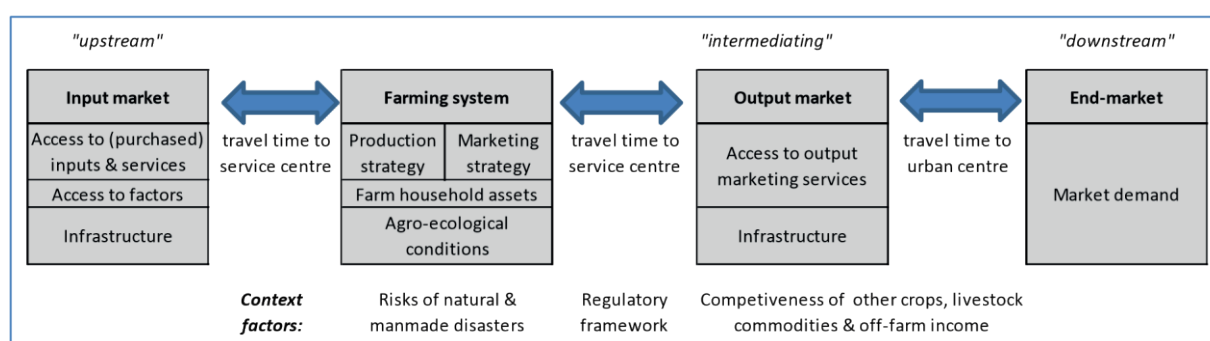


Figure 2. Spatial factors in market quality affecting production and marketing strategies of smallholders

Table 2 highlights the main spatial factors, for each step in the value chain, and the farming system elements that can be expected to be influenced by them. Their influence on market orientation of dairy farming will be analysed using descriptive statistics, and underlying mechanisms will be explored.

Table 2. Framework for analysis of spatial factors influencing dairy farming systems

Farming System	Spatial factors	Influence on
Farm household assets ⁴	land (farm size); water sources; real estate	herd size and composition; crop options; agro-biodiversity; income sources; animal disease prevalence; farming practices; farm technology; household consumption preferences; access to production factors land, labour and capital
Agro-ecological conditions ⁵	altitude; rainfall; temperatures; soil types; biodiversity	
Input market quality		
Infrastructure	proximity of farm to ISPs; proximity ISPs to urban centre; density of dairy farm distribution; road density and – conditions throughout year; utilities – electricity; piped water; ICT network connectivity	education level; means of transport; access to stock, artificial insemination services, animal health services, drugs and pesticides, feed, seeds, fertiliser, farm equipment and fuel, farm advice, information, financial services
Access to inputs and services	density of ISPs	
Access to factors	land, labour and capital markets	
Output market quality		
Infrastructure	milk collection grid; road network (density, quality and distance to all-weather road) ⁶ ; electricity and water grid; ICT network connectivity; public transport services	access to milk collection, transportation, processing, distribution and/or direct milk market outlets – availability, reliability, contacts and transaction costs
Access to output marketing services	proximity/travel time to service centre (MCC) and to urban centre	
End market quality		
Market demand	demographic dynamics; income dynamics; changes in consumer	dynamics in the effective demand at farm level for milk and dairy products from both urban and rural

	characteristics; distance and sourcing relationships	consumers – prices, seasonality, reliability ⁷
Context factors: some context factors with spatial influence need to be considered, as these are expected to differ between countries and between locations within countries:		
Risks of natural & manmade disasters	droughts, livestock disease outbreaks, and political changes	agro-ecology; farm household assets; in- and output market demand; impact of regulations at farm level; likelihood that areas that at one time are suitable for dairy may lose out to other cash crops (like potatoes, coffee, tea, or sugarcane), livestock commodities (like stock, beef or eggs) or off-farm income
Regulatory framework	spatial effects of regulations relevant to dairy farmers and dairy chain actors, regarding milk marketing, labour and land use; including development policies for remote areas	
Competitiveness of dairy	dynamics in market, policy or agro-ecology that render dairy less profitable	

⁴ Hamilton-Peach & Townsley, 2004; Poole et al., 2013

⁵ van de Steeg et al., 2010

⁶ Roads can be classified as (milk collection trucks may use roads of types i) and ii):

- i.* all-weather roads that farmers can travel on with either private or public transport and that ISP vehicles can travel on to reach farms, year-round
- ii.* feeder roads with secondary surfacing that can be used part of the year, and
- iii.* farm roads that cannot be used regularly by vehicles at all or not without much difficulty.

⁷ At remote farm level this can, for example, translate into the possibility to sell to processors in the dry season when milk supply is low, but not in the rainy season, when processors can get plenty of milk nearby their plants.

Research set-up

To test the analytical framework presented in the previous section, a field study is being carried out that combines analysis of spatial distribution of dairy farming systems, quality of in- and output markets, and market orientation of farmers. This research focuses on spatial factors along a double gradient from high to low market quality. It pursues more in-depth understanding by looking at two cases of market quality gradients for smallholder dairy farming in Ethiopia and Kenya.

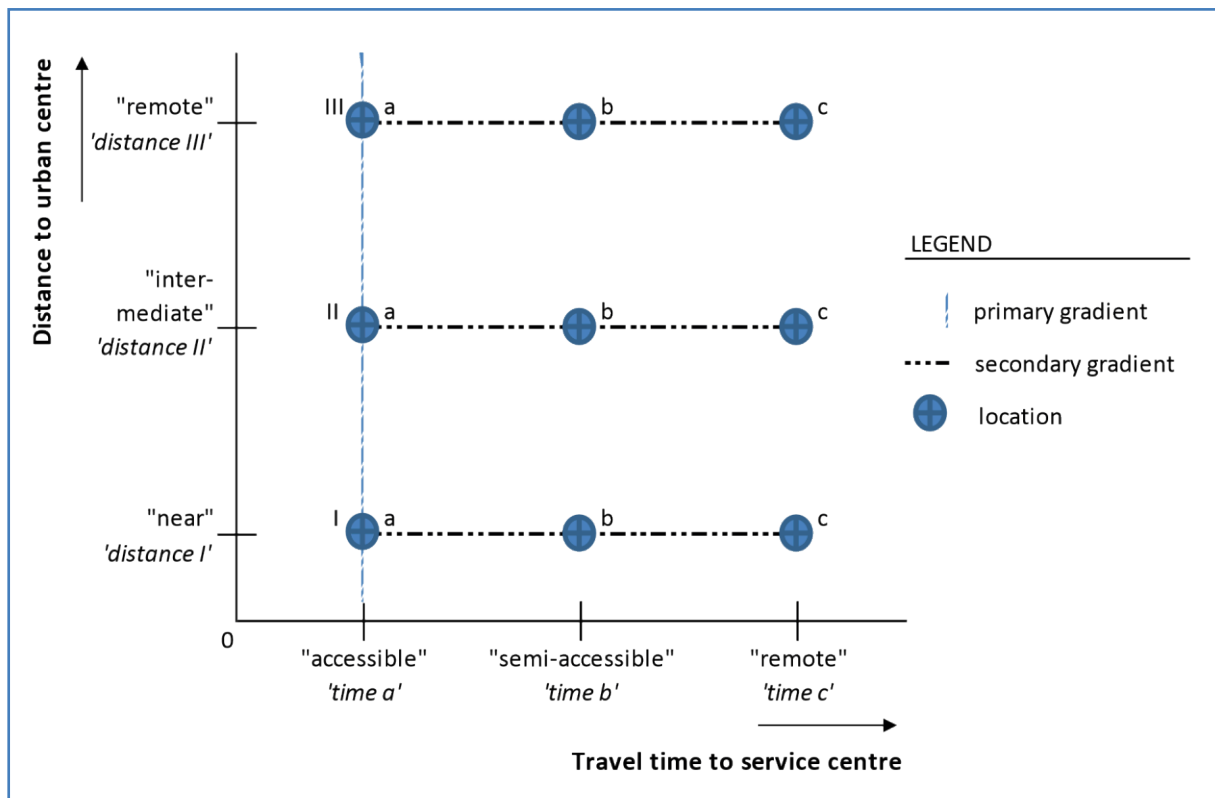


Figure 3. Primary and secondary gradients in research setup

In Kenya and Ethiopia two study areas were selected that are considered to be areas with good dairy potential for smallholders. After scoping of collection and service infrastructure, a gradient in terms of density of i) input supply services and ii) output marketing services was selected in each study area:

- *Primary gradient* – Three locations (I-III) with dairy potential for smallholders along a market quality gradient (at increasing travel time from urban market); areas with plantations and areas that due to low rainfall have low dairy potential were left aside. In East Shoa and Arsi zones, Ethiopia, three locations were selected along the axis from the urban centre Addis Abeba to remote parts of Arsi (Bek’oji and Sagure districts); in Nyandarua County, Kenya, three locations were selected along the axis of secondary town Nyahururu to remote parts of Kipipiri sub-county. Selection resulted in:
 - location (I) being a town centre of 50-100,000 people that is (relatively) close to a major urban centre with strong market pull, where multiple milk collection centres are available – Ol Kalao, Nyandarua, Kenya (close to Nyahururu, with good connections to urban markets) and Bishoftu, East Shoa, Ethiopia, close to Addis Abeba;
 - location (II) being a town service centre with moderate market pull, with input shops and one or few (preferably chilled) milk collection centres - Wanjohi in Kenya and Bek’oji in Ethiopia;
 - location (III) being a small rural centre that is considered remote by local standards, with some services at the main, gravel road (Geta in Kipipiri sub-county, Nyandarua county, Kenya; Danisa in Sagure district, Ethiopia).

Areas with plantations and areas where agro-ecology favours cash crops over dairy (due to lower altitude and rainfall) were not selected, explaining the relatively large distances between Bishoftu and Bek'oji and between Ol Kalao and Wanjohi.

- *Secondary gradient*: in each of the locations I-III, a secondary gradient was established with again three sub-locations (a-c), differing in travel time from all-weather roads and 'the market' (a service centre with IPSs and output market opportunities): a) accessible (close to service centre, close to type i) all-weather roads); b) semi-accessible (1 hour walk from service centre, accessible by type ii) feeder roads); and c) remote (0.5-1 hour walk from feeder road, 1.5 -2 hours walk from service centre, located along type iii) farm roads) (see Figure 3). This gradient is in line with distinctions made by (Gebremedhin et al., 2014).

In each of the nine sub-locations in each study area, ten farmers are randomly selected from all dairy farmers in the sub-location, as provided by the local livestock department office, so ninety dairy farms and their market linkages are investigated in each study area, using questionnaires and focus group discussions with dairy farmers and former dairy farmers, and interviews with ISPs and key resource persons.

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References

- Akinlade, R.J., Balogun, O.L., & Obisesan, A. A. (2016). Commercialisation of Urban Vegetable Farming. *International Journal of Vegetable Science* 22(1): 24-34.
- Bahta, S., & Malope, P. (2014). Measurement of competitiveness in smallholder livestock systems and emerging policy advocacy: an application to Botswana. *Food Policy* 49(P2): 408-417.
- Barrett, C.B. (2008). Smallholder market participation: concepts and evidence from Eastern and Southern Africa. *Food Policy* 33(4): 299-317.
- Barrett, C.B., Bachke, M.E., Bellemare, M.F., Michelson, H.C., Narayanan, S., & Walker, T.F. (2012). Smallholder participation in contract farming: comparative evidence from five countries. *World Development* 40(4): 715-730.
- Duncan, A., Teufel, N., Mekonnen, K., Singh, V., Bitew, A., & Gebremedhin, B. (2013). Dairy intensification in developing countries: effects of market quality on farm-level feeding and breeding practices. *Animal* 7(12): 2054-2062.
- Gebremedhin, B., & Jaleta, M. (2010). Commercialisation of Smallholders: Is Market Participation Enough? Paper presented at the Joint 3rd African Association of Agricultural Economists (AAAE) and 48th Agricultural Economists Association of South Africa (AEASA) Conference, Cape Town, South Africa, September 19-23, 2010.
- Gebremedhin, B., Tegegne, A., Hoekstra, D., Jemaneh, S., Shiferaw, K., Bogale, A., & Getahun, Y. (2014). Developing the butter value chain in Ethiopia. LIVES Working Paper I. Nairobi, Kenya.
- Groot, J.C.J., Oomen, G.J.M., & Rossing, W.A.H. (2012). Multi-objective optimisation and design of farming systems. *Agricultural Systems* 110(0): 63-77.
- Hamilton-Peach, J., & Townsley, P. (2004). An IFAD Sustainable Livelihoods Framework. Retrieved from <http://ifad.org/sla/framework/index.htm>, Rome.
- Hoddinott, J.F., Headey, D.D., & Dereje, M. (2014). Cows, missing milk markets and nutrition in rural Ethiopia. ESSP Working Paper 63. Addis Abeba: IFPRI.
- Jaleta, M., Gebremedhin, B., Tegegne, A., Jemaneh, S., Lemma, T., & Hoekstra, D. (2013). Evolution of input supply and service hubs in dairy development at Ada'a milk shed in Ethiopia. [Development in Practice]. *Development in Practice* 23(2): 249-263.
- Kyeyamwa, H., Verbeke, W., Speelman, S., Opuda-Asibo, J., & Huylenbroeck, G.V. (2008). Structure and dynamics of livestock marketing in rural Uganda: constraints and prospects for research and development. *Journal of International Food & Agribusiness Marketing* 20(4): 59-89.

Moll, H.A., Staal, S.J., & Ibrahim, M. (2007). Smallholder dairy production and markets: a comparison of production systems in Zambia, Kenya and Sri Lanka. *Agricultural Systems* 94(2): 593-603.

Mugisha, A., Kayiizi, V., Owiny, D., & Mburu, J. (2014). Breeding services and the factors influencing their use on smallholder dairy farms in central Uganda. *Veterinary Medicine International* 2014: Article ID 169380, 6 pages <http://dx.doi.org/10.1155/2014/169380>

Muriuki, H., & Thorpe, W. (2006). Smallholder dairy production and marketing in eastern and southern Africa: Regional synthesis. Paper presented at the South-South Workshop on Smallholder Dairy Production and Marketing.

Mutambara, J., Dube, I., Matangi, E., & Majeke, F. (2013). Factors influencing the demand of the service of community based animal health care in Zimbabwe. *Preventive Veterinary Medicine* 112(3-4): 174-182.

Novo, A.M., Slingerland, M., Jansen, K., Kanellopoulos, A., & Giller, K.E. (2013). Feasibility and competitiveness of intensive smallholder dairy farming in Brazil in comparison with soya and sugarcane: case study of the Balde Cheio Programme. *Agricultural Systems* 121: 63-72.

Omiti, J., McCullough, E., Otieno, D., Madelon, M., Nyanamba, T., & Murage, A. (2006). Participatory prioritisation of issues in smallholder agricultural commercialisation in Kenya. KIPPRA Discussion Paper No. 64. Nairobi: Kenya Institute for Public Policy Research and Analysis.

Pingali, P.L., & Rosegrant, M.W. (1995). Agricultural commercialisation and diversification: processes and policies. [Agricultural Commercialisation and Diversification]. *Food Policy* 20(3): 171-185.

Poole, N.D., Chitundu, M., & Msoni, R. (2013). Commercialisation: a meta-approach for agricultural development among smallholder farmers in Africa? *Food Policy* 41: 155-165.

Poulton, C., Dorward, A., & Kydd, J. (2010). The future of small farms: new directions for services, institutions, and intermediation. [The Future of Small Farms Including Special Section: Impact Assessment of Policy-Oriented International Agricultural Research (pp. 1453–1526)]. *World Development* 38(10): 1413-1428.

Reardon, T., Boughton, D., Tschirley, D., Haggblade, S., Dolislager, M., Minten, B., & Hernandez, R. (2015). Urbanisation, diet change, and transformation of the downstream and midstream of the agri-food system: effects on the poor in Africa and Asia. *Faith & Economics* 66: 43–63.

Reardon, T., Tschirley, D., Haggblade, S., Minten, B., Timmer, P., & Liverpool-Tasie, S. (2014). Five Inter-Linked Transformations in the African Agri-food Economy: Food Security Implications. Paper presented at the AU meeting 2013, Addis Ababa.

Shiferaw, B., Obare, G., & Muricho, G. (2006). Rural Institutions and Producer Organisations in Imperfect Markets: Experiences from Producer Marketing Groups in Semi-Arid Eastern Kenya. Socioeconomics and Policy Working Paper Series no. 23.

Somda, J., Tollens, E., & Kamuanga, M. (2005). Transaction costs and the marketable surplus of milk in smallholder farming systems of The Gambia. *Outlook on Agriculture* 34(3): 189-195.

Udo, H.M.J., Aklilu, H.A., Phong, L.T., Bosma, R.H., Budisatria, I.G.S., Patil, B.R., & Bebe, B.O. (2011). Impact of intensification of different types of livestock production in smallholder crop-livestock systems. *Livestock Science* 139(1): 22-29.

van de Steeg, J.A., Verburg, P.H., Baltenweck, I., & Staal, S.J. (2010). Characterisation of the spatial distribution of farming systems in the Kenyan Highlands. *Applied Geography* 30(2): 239-253.

van der Lee, J., Zijlstra, J., Wouters, A.P., & van Vugt, S.M. (2014). Milking to Potential: Strategic Framework for Dairy Sector Development in Emerging Economies. Discussion paper (pp. 30). Wageningen: Wageningen University & Research centre.

van der Ploeg, J.D. (2008). *The New Peasantries: Struggles for Autonomy and Sustainability in an Era of Empire and Globalization*. London: Earthscan.

van Melle, C., Arinloye, D., Coulibaly, O., Vayssières, J.F., & Hell, K. (2013). Contribution to mango value chain development in Benin - a producer perception survey. Paper presented at the Proc. 4th International Symposium on Tropical and Subtropical Fruits.

von Thunen, J.H. (1875). *The Isolated State In Relation To Land Use and National Economy*. Berlin: Schmaucher Zarchlin.

Voors, M.J., & D'Haese, M. (2010). Smallholder dairy sheep production and market channel development: an institutional perspective of rural Former Yugoslav Republic of Macedonia. *Journal of Dairy Science* 93(8): 3869-3879.

Participatory assessment of value chains for diversifying small-scale farms – developing a tool for practitioner-led analysis and innovation

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Abstract: Diversified income sources and land use options are sought in small-scale farms and rural households like those in the Nabanhe River Watershed National Nature Reserve (NRWNNR) in Southwestern China, in order to ensure sustainability of their livelihoods. Alternative income generating activities, such as trying out new crops, are often chosen by small-scale farmers using few criteria for decision-making such as expected profitability, government recommendations and labour need. While such trials bear certain risks, poor households may have little buffer in their resources – they depend on success of their trial. Governmental entities in the region have been trying for many years to support farmers in diversifying their activities. However, success depends not only on aspects of production itself but on various conditions within and around the respective value chains. A system view is needed when assessing how far the conditions for successful participation of farmers and rural families in particular value chains can be fulfilled. Within a Sino-German transdisciplinary research project an assessment tool is being developed which aims at assisting extensionists and government entities in this endeavour. Embedded in consultative or collaborative innovation processes, the tool is meant to assist communication and system diagnosis. In this article the general functioning of the tool is described and first insights from the development process outlined. Based on practitioners' feedback, conclusions are drawn for its further scrutiny and development, with a view on different possible uses within and beyond the currently specified circle of stakeholders, e.g. farmers' groups, rural cooperatives, value chain committees and other public-private entities. The paper therefore discusses the tool in the context of a variety of theories and development approaches. A future purpose of the tool could be – possibly via the use in extension - to increase farmers' ability to make their own assessments when choosing livelihood activities. Based on the tool, supporting organisations may help design specific measures to overcome any difficulties in fulfilling the necessary conditions. Instead of leaving value chain analysis to researchers alone, stakeholders can then use the assessment framework for their own purposes, or commission research to be done on its basis.

Keywords: Income-generation, value chains, decision-making, land use, research governance, decision-support tool

Introduction: why this tool?

Smallholders and other rural households traditionally rely on diversified income sources - including subsistence - to secure their livelihoods. However, the growing need to specialise production and farmers' expectations of increased incomes lead smallholders to devote most or all of their resources to a single crop, in particular when regional clusters develop for its production and processing.

This has also been the case in Xishuangbanna district in Yunnan Province (China). Rubber production developed in the region since the 1960s, and after privatisation of farms in the 1980s numerous smallholder farmers adopted rubber as a main crop and income source (Xing & Song, 2010; Häuser et al., 2015). Household income has increased significantly due to this shift in land use. Farmers in the province's Nabanhe National Nature Reserve (NRWNNR) reported a stark improvement in their livelihoods situation - in many cases they succeeded in escaping poverty (Aenis et al., 2013). According to Liu et al. (2006) the per capita net income in Menglu County in Xishuangbanna increased three-fold between 1988 and 2003.

Needless to say, such specialisation involves many risks. Rubber prices are volatile on the global as well as on the local scale. This adds to extreme weather situations and other potentially adverse conditions. In the case of rubber, poorer households are also more vulnerable in such situations, as found e.g. in Xing and Song (2010).

Re-orientation towards diversification, including new crops and activities, has been ongoing for some time in the NRWNNR. An overview of the numerous crops promoted may be found in Tang (2013). Both Tang and Aenis et al. (2013) report difficulties of farmers, showing that such initiatives do not guarantee success. Here, and in the developing world, such initiatives to try new crops and activities are often induced by governmental bodies or international organisations. The choice of activity - largely linked to the choice of participating in a certain value chain (VC) - is mainly based on farmers' own perceptions or, in the case of value chain development (VCD) projects, on studies of consultants and a set of pre-set criteria. Stoian et al. (2012) conclude that very poor households may lack the necessary assets to effectively participate in value chains, which may explain mixed results of VCD projects. They have identified a lack of knowledge on minimum thresholds for "value chain readiness" of poor households and their business organisations.

It is acknowledged that an ex-ante assessment is usually done in decision-making processes on different levels. However it appears that analyses are not always very systematic and may not include aspects related to the functioning of whole value chains and local livelihoods systems - even if much of the information is implicitly available. For example, present market price and existence of a buyer are often used by actors as indicators along with certain pragmatic and development-related criteria of the planning and implementing organisations, such as potential for income and employment and previous experience in the sector (see e.g. McKague & Siddiquee, 2014). Yet the conditions of participation in such value chains and the necessary know-how may remain unclear, and so does the possible need for support at specific moments during the diversification process. Very disenfranchised groups may require non-market interventions beforehand (Stoian et al., 2012). It is assumed that a more holistic ex-ante assessment may reduce the risk of failure particularly of the most vulnerable actors. It is necessary to assess whole value chain systems and livelihoods, not only selected criteria, to increase chances of success. This means to assess carefully the conditions for participation of smallholders in value chains. Poor households in particular have little buffer to overcome failed investments, risks are high for them. Several manuals for VCD exist (for an overview see Donovan et al., 2015). They normally include little information on methods to assess ex-ante if producers' participation in the selected VC may really be effective, sustainable and beneficial.

In order to determine the chances of successful diversification, ex-post analysis of why certain activities have been adopted and maintained by rural people in the past may be tried. By elaborating the influential factors it may be possible to draw conclusions on the success of future diversification initiatives. It is acknowledged, on the one hand, that the complexity and interdependency of these factors poses limits to such predictions. On the other hand, any model which may be constructed to reflect this system's interaction could hardly be applied and handled by local decision-makers in practice. An option would be to leave this analysis to researchers or consultants who may analyse the potential of each possible diversification option. However this requires many resources which often are not available. Furthermore such analyses tend to disregard the wealth of expertise which the different local practitioners have, including their implicit knowledge. And finally, as the conditions change quickly and new income diversification options regularly appear, it is concluded that a more sustainable and pragmatic strategy would be to support local decision-makers in performing their own assessments.

For these reasons an easy-to-use assessment framework approach is being developed within the Sino-German transdisciplinary research project SURUMER. Its purpose is to be used and adapted by the practitioners involved in decision-making on diversification strategies, first and foremost in the NRWNNR, but with the perspective to be adapted elsewhere. In the nature reserve farmers depend to a large degree on local administration and policy-makers to suggest and promote options for diversification (Bartosch et al., 2015). Hence the practitioners and policy-makers at local and regional level are the main target group for the anticipated research output - a guide for the assessment of diversification options.

The objective of this paper is therefore to present and generate discussion on this approach that aims at increasing the ability of different stakeholders to assess the chances for success of different income-generating activities for smallholders in a Chinese nature reserve and its possible adaptation to other target groups and regions.

Theoretical background

The criteria for assessing smallholders' success of participating in certain value chains are mainly based on value chain approaches and system theory and thus form an important theoretical background for the assessment guide itself. Subsequently, decision theories and system theory form the basis for embedding it in extension and decision-making processes.

Value chain approaches

The systemic view of value chain analysis

Value chain analysis (VCA) helps with understanding - among other things - the mechanisms for the functioning of value chains. For this purpose a value chain is regarded as a system (i.e. relationships between actors in the VC) with its regulatory and supporting environment (relationships with actors outside the VC). It needs to be considered that instead of a linear chain as stipulated by the term, the set of seller-buyer relations represents a network in reality. At each step sellers have the possibility to serve several buyers, so that the chain fans out and interlaces with others. Given the rather methodological focus of this approach, it is often combined with further theories like new institutional economics or the Sustainable Livelihoods approach in order to create a suitable theoretical and analytical framework for the selected objective. Governance aspects in particular can be explained within such an analysis and are

of particular relevance for the assessments to be performed here. Short or long term contractual agreements between producers and buyers, quality standards of the industry as well as the arrangements made for functional distribution of tasks between actors along the chain all are among the governance aspects analysed. Government regulations on the specific industry and the overall legal environment of making business are considered, i.e. governance aspects of the chain environment. Some of the conditions and questions formulated in the assessment guide are based on VCA variables.

Value Chain Development (VCD)

In contrast to VCA used in research, VCD is a market-based approach used by organisations in developing cooperation within projects and programmes that aim at increasing commercialisation of smallholder production and ultimately e.g. reducing poverty of rural households, along with other development objectives like employment generation of youth, economic growth, environmental performance, or gender equality (UNIDO, 2011). The focus is on building collaborative management strategies for developing (part of) a new value chain in which specific target groups - often smallholders - are involved, or on “upgrading” an existing value chain. Humphrey and Schmitz (2002) categorised four types of upgrading: 1) upgrading of production processes, 2) product upgrading, 3) functional upgrading and 4) inter-sectoral upgrading. Two main approaches are used in VCD interventions: *Linkage approaches* which support business relationships between participating actors, and *Lead Firm approaches*, where support is channelled via a selected central enterprise within the chain as potential agents for upgrading other chain actors (Humphrey & Navas Alemán, 2010).

Typically, external consultants or cooperation agencies perform initial analyses of markets as well as other criteria including internal and external conditions of several products and VCs, then a product or VC is chosen -sometimes with consultation of stakeholders. The theoretical and analytical framework of the initial VCA is very often put forward by development agencies, contracted consultants and sometimes the government. Many VCD manuals include a chapter explaining this step in general terms, but without the level of detail necessary to allow local actors to perform their own assessments.

For the purpose of developing the assessment framework the main interest in VCD approaches lies with the methods and criteria for choosing products and value chains which subsequently become the focus of VCD projects. Some of the criteria are included in the assessment framework - they usually refer to the overall focus and objectives of development, such as finding income sources for specific target groups or other social, economic and/or environmental sustainability objectives.

Sustainable Livelihoods Framework – the asset focus

Value chain approaches in development cooperation may contribute to objectives like poverty reduction and food security only if understood and used in the complexity which they imply (Currell et al., 2014). However these outcomes are not a matter of course - even in functioning value chains the distribution of profits, the development of prices and thus the effect on incomes depend on many other factors. Newly arising risks need considering too. VCD projects often disregard that poor households need to pursue diversified livelihoods strategies. Instead, they require participating actors to follow a specialisation strategy with higher resource investments in the given chain. This results in risky trade-offs for the investment of

capital, labour and other resources which especially asset-poor households cannot maintain (Stoian et al., 2012).

Although many VCD projects have a pro-poor focus, the impact of the approach on poor rural households remains uncertain given the simplified conceptual models used, and hence Stoian et al. (2012) conclude that asset-based VCD assessments are required in order to prove direct links between the interventions and any increased resilience of smallholder businesses and households. They also argue that minimum asset thresholds exist for successful participation in VCD (see also Donovan & Poole, 2011).

Such considerations have led to the inclusion of questions on specific asset availability and likely trade-offs into the assessment guide. These are based on the five capitals described in the Sustainable Livelihoods Framework (Scoones, 1998), namely natural, physical, financial, social and human capital. However, it is acknowledged that the guide should be useful also in situations where no fully-fledged VCD projects can be implemented and where diversification is pursued in less structured processes and with little or no outside support.

Inclusive value chain development

Besides pure VC functioning the guide should offer the option to specifically focus on benefits for certain target groups like rural youth, women or very poor households. Inclusive VCD focuses on similar target groups, aiming at increasing their assets and independent income-generating possibilities (see e.g. McKague & Siddiquee, 2014; UNIDO, 2011; Mutua et al., 2014, Riisgard et al., 2010). Experience has shown that specific conditions, assets and VC characteristics need to be in place for those target groups to directly benefit from participating - or be able to participate in the first place (Stoian & Donovan, 2007). Our own research in China and Vietnam indicates that e.g. very poor farmers are less integrated in networks where knowledge and information are exchanged, be they informal relations or formal extension activities. The approach is therefore useful for including criteria and questions in the guide which allow for an assessment of VCs with this objective of inclusion. According to authors cited above, there are three necessary elements to have inclusive VC and sustained trading relationships: i) capable farmers (skills, capacity and organisation); ii) willing buyers (private sector policies); and iii) enabling environment (public and donor policies). The Link methodology, for example, is applied to design and implement inclusive and sustainable business models linking small scale producers in developing countries to markets. It is based on a set of participatory tools adapted from value chain analysis, business model assessment, prototyping and related fields (Lundy et al., 2012).

Systems perspectives

As shown above value chains are often viewed and analysed as systems. Likewise rural communities and households can be seen as systems, as reflected in the Sustainable Livelihoods approach (Scoones, 1998). This reflects the recognition that processes of social change are complex and function according to dynamic but reinforcing patterns and organisational principles (autopoiesis). Trying to predict outcomes of an intervention is difficult, but chances are increased if the system is understood in its complexity. Systems theories are useful for analysis, but have a role in consultative processes too, as used for example in systemic organisational consultancy or in family therapy. Several elements of the systems approach are relevant for the assessment and have been integrated into our guide:

- We assume the constructivist viewpoint that people make decisions according to personal perception of their reality, therefore these perceptions matter.
- People can learn and innovate if new information can be linked to existing concepts, otherwise it will be ignored because people cannot attach meaning to it. If a new activity is envisaged it should be examined if people are able to effectively relate to it based on their own experiences, routines and context. Likewise, any changes that the new activity implies must not create strong disturbances or irritation. An example is the change in gender roles which cannot be forced in a short period of time.
- Ignoring is a strategy as well if actors do not have enough knowledge to decide on changes or alternatives. This functions as a precautionary principle in the face of high perceived risks.
- The format of questions is used to broaden users' analysis and include perspectives of various stakeholders. The tool should stimulate cooperation to eliminate blind spots that individuals may have in their perception of a situation.
- In accordance with good consulting practice no final "best solution" is suggested, users have to draw their own conclusions.
- The assessment should be embedded in a consultative process e.g. in extension or planning, it cannot be expected to cover all aspects that specific individuals need to consider in their specific situation and environment.

Decision-making

Against the background of the described planning task, the question arises whether and what type of instruments and methods of decision support needs to be developed. It is important to clarify what contribution such an instrument can provide for the decision-making processes. From the tasks described before the following features of the planning situation can be derived:

1. There are complex social and ecological relationships. Beyond that in the observed value chains, the interests of various stakeholders are to be taken into account.
2. Overall, the system under consideration is characterised by a multitude of interdependencies and non-linear relationships.
3. This results in various types of uncertainties; the fact that on the one hand, future developments are difficult to predict in the markets and given the global connectivity of markets a high degree of volatility can be expected. Also, uncertainties arise from the fact that different stakeholders with different interests are involved, so that their behaviour is difficult to predict.
4. The planning situation is also characterised by the fact that both the availability of resources and means and the objectives are often inadequately operationalised.

For decision theory, such ill-structured problems are characterised by the participation of several actors (multi-actuator problem) and in which neither the objectives nor the means and resources are clearly known and operationalised. Dörner (1989) distinguishes different decision situations according to the degree to which the ends (purpose) and means are known in decision-making processes. In a fourfold table (Figure 1) these situations are summarised. Corresponding instruments for decision support were added by us in brackets.

		Clarity of objectives	
		High	Low
Knowledge about means and resources	High	Barriers of interpolations (Algorithms)	Dialectic barriers (Scenarios, Multi-criteria evaluation methods)
	Low	Barriers of synthesis (Search methods + algorithms)	Dialectical and synthesis barriers (Transparency-creating analysis and evaluation heuristics)

Figure 1. Characteristics of decision situations and corresponding decision support instruments. (Own elaboration based on Dörner (1989)).

As a consequence, the decision support tool described herein should be both flexible to incorporate a variety of alternatives, as well as clearly present possible consequences, contributing to a balanced assessment with regard to the development objectives. However, this means that planning tools cannot be based on algorithmic methods. Rather, it is necessary to use heuristics representing the goals and expectations of the various stakeholders. It is not intended to find optimal solutions. Rather, to be demonstrated by certain scenarios, the consequences associated with certain planning assumptions should be made transparent. This creates the conditions that will allow the various players to determine their position in the decisions process and possibly also take a collective decision. The advantage of this method is that they contribute to greater transparency regarding the complex decision situations and thus also support a more participatory or self-directed approach. Moreover, the approach takes into account the complexity and uncertainty of decision situations. In summary, it allows the taking into account of the interests of small farmers systematically in the decision-making process - a prerequisite for the development of inclusive value chains.

Methodology of tool development

Starting point and demands towards the guide

In the given context we considered that farmers compare any potential income-generating activity against their experience with rubber cultivation – an activity which has brought riches to many, as well as relative autonomy vis-a-vis various sales options to choose from, but with many risks and high demands on physical labour at night-time. Many farmers in the NRWNNR have regularly tried other crops and innovations, but keep up high expectations towards profitability. At present rubber prices are very low, and outlooks are not so good anymore, so they are motivated to diversify (Bartosch et al., 2015). However, these farmers often are risk averse (for various reasons) and rely on recommendations or support by authorities or state farms. Hence, staff of these authorities as well as extension workers are the primary target group of the guide, in particular the nature reserve authority as a highly trusted organisation. They have suggested further uses and adaptations for farmer training, workshop and extension purposes.

After a first round of feedback from stakeholders, demands concerning the guide and framework have been formulated as follows:

- It should be sensitive to different development objectives and main criteria for value chain selection
- A systemic value chain approach is required
- It should account for the complexity of reality but be simple enough to be actually used by practitioners
- Both minimum conditions for value chain functioning and producers' own criteria should be included
- It should encourage communication between users and with other experts
- It should be computer based, running with a well-known internationally available programme and easy to use
- With some adaptation it should be usable for a variety of development objectives and diversification options (intercropping and alternative crops, animal production, land lease, non-farming activities)
- It should form the basis for a framework embedded in consultative processes which can be used by extension services, and eventually together with farmers themselves

Transdisciplinary process

In order to make this a useful tool for practitioners in policy-making and administration, collaboration of their representatives is necessary during its development. This fits very well with the transdisciplinary approach in the SURUMER project (see <https://surumer.uni-hohenheim.de/>). Transdisciplinarity allows for collaboration of practitioners and researchers in solving societal problems, and it has a focus on implementation of elaborated solutions. An analysis was performed of stakeholder experiences and views on diversification to understand priorities and decision-making criteria of smallholders in NRWNNR. Data originated from a qualitative WTA study and other semi-structured interviews conducted over 2 years in NRWNNR. On this basis, and drawing from the literature on value chain analysis and inclusive value chain development, a first draft assessment framework and guide have been developed. Feedback from potential users was sought during a workshop last year. Under that impression the idea for a computer-based, better structured tool was developed. Then further literature was reviewed for scrutinising conditions and questions of the assessment framework. The new - now Excel based - prototype is programmed with the focus on easy handling and more targeted content. A second more detailed feedback is sought from local stakeholders, using two promising diversification alternatives in comparison to rubber production, namely dragon fruit (*Hylocereus* ssp.) and horseradish tree (*Moringa oleifera*). A possible short Delphi study may help with scrutinising the criteria and questions used in the tool, and shed light on possibilities for adaptation to further regions, contexts and target groups. The final version could then be the starting point of a possible new project involving trials in different regions and with different user groups.

Farmers' willingness to try new crops and activities

In the NRWNNR farmers' willingness to try new crops and other activities has been investigated in interviews, not only in farm households but also among state actors working in the region (Bartosch et al., 2015; own interviews). Furthermore conclusions have been drawn from past decisions of these farmers on diversification. Farmers' interest and experiences in trying out a variety of crops has been documented in Tang (2013). These trials were

sometimes based on orders from administrative bodies or state farms, but have left farmers with a mixture of experiences which now influence decision-making on diversification.

Prolonged periods of low rubber prices or low success with on rubber production - for example in high altitudes - have increased farmers' propensity to diversify. Furthermore, farmers mentioned the following conditions for their engagement in new activities:

- It is not required to cut down productive rubber trees. For farmers with little land it is especially crucial that little land is occupied with the activity, those with excess land may evaluate the expected success against the gains of renting out their excess land.
- Basic criteria are profitability and labour need. In this sense farmers compare expected profitability and labour needs of the activity not only with rubber production, but also with the option to rent out their land (and possibly take on paid work). Farmers are willing to try the activity if it offers relatively high income and/or relatively comfortable working conditions - both in terms of amount and timing. A balance with running rubber production is sought here.
- Profits should be expected within 3-5 years. Numerous farmers do try out crops with a long-term expected profit but in this case look out for another activity which offers short term profit in addition.
- Farmers should have heard that the product offers a high relative sales price or profitability at the time of decision-making. There is awareness among interviewed farmers that prices may change substantially until the new product can be marketed, in particular in the case of trees like rosewood that take 60 years until they can be harvested. Asked why they nevertheless use this indicator, it has been explained that in the absence of a better indicator this one is preferred to none.
- Positive and observable examples for the activity exist in the vicinity, the village or in the family. Simple information is often not enough and may not even reach all households. Success stories do.
- Crops are recommended by NRWNR Bureau and/or supported by giving out seeds for free and/or some training. Experiences from the past shape expectations here.

Whereas many of these conditions recur in the interviews and observations, there seems to be a certain flexibility; some conditions are weighed less if others are fulfilled satisfactorily. We have not tried here to gain a representative and complete understanding or model the decision-making process of particular farm households. The above findings are deemed sufficiently robust to serve as input for the assessment framework. Differences among farm households are acknowledged, and therefore the conditions mentioned and observed appear at different points within the framework, some as basic conditions for farmers/rural people to engage in an activity, and some as conditions for specific target groups.

Description of the tool and its intended application

Users and uses of the guide

As mentioned above, actors in policy and extension who are concerned with diversification strategies for farms and rural households are a primary target user group. The guide may be used by them in planning and extension processes, in particular when trying to assess which land use or income generation option is feasible and desirable for farmers –‘considering the value chains and their conditions which farmers would then become part of. As a result, consultations with farmers or, as done in China, production planning and support to farmers

can be based on more comprehensive assessment. In the context of SURUMER it did not seem desirable to target farmers directly as users, even though they are the decision-makers on their own livelihoods' strategies. This is because of the dynamics in collaboration within the transdisciplinary process, and because of project-specific limitations. However, a possible further development of the guide towards application with and by farmers is discussed, and the Nature Reserve Bureau is considering further research funding applications for application of the guide.

Description of the guide

The first draft version of the guide consisted of a short three-step assessment procedure, the main part of which was a table of assessment criteria, related questions to be answered, boxes for selecting one of three answering options in a traffic-light-style, and the option to name possible improvement measures for insufficiently fulfilled criteria. It assumed that development priorities (i.e. the main focus of development objectives for the rural target groups and regions) are known already. These development priorities should be considered when performing the assessments, but the guide itself does not focus on the process of prioritising. The latter is covered well in various value chain development manuals (e.g. McKague & Siddiquee, 2014). This first version was presented in a stakeholder workshop in August 2015 for feedback. The discussion revealed the need for simplification. Furthermore the idea came up of differentiating the matrix according to the different development objectives or for different actors. The possibility to restrict answers to 'yes' or 'no' would be appreciated too, for easier final assessment. Finally it was suggested that the factors and questions most crucial for VC functioning be highlighted in the matrix. A basic dilemma proved true: users are interested in simple application, but a high quality of the assessment needs to be maintained vis-à-vis the complex reality of farmers, their livelihoods and the environment.

Consequently, a new prototype needed developing which simplified the use of the guide but did not compromise on the quality of analysis to be done. Hence an Excel-based format was chosen, with filters that ensure that users are only presented with the questions which fit their pre-selected development priorities. Responses are then processed to a graphical representation which allows easy identification of strengths and weaknesses of each activity analysed. Excel was chosen because it is globally available and does not require much training for users. Any new programme would require training and regular technical maintenance.

After an introductory explanation users are led through a procedure of five interconnected steps. In Step 1 users chose the income generating activities to be assessed. At this point users are also prompted to voice any basic reservations against any of the activities. This allows for "gut feelings" to surface before any detailed rational assessments are made.

Prioritisation of development objectives (Step 2) determines the basic focus of the ensuing assessment. Objective A) is compulsory: "Minimum conditions for successful engagement of rural people in the value chain/activity". These minimum conditions of functioning have highest priority and must be assessed in any case, because if basic functioning of the value chain is not feasible it does not make sense to analyse any further criteria. Besides, users may give high or medium priority to one or two more development objectives. These overall objectives are put forward based on commonly used criteria for selecting value chains in VCD projects and manuals. In VCD projects organisations sometimes try to simultaneously cover all the

above development objectives (see e.g. McKague & Siddiquee (2014), or at least ensure that the project does not have detrimental effects on any of them. We chose a pragmatic approach by including this step, following the recommendation of our practitioner partners. However in other contexts this step could be omitted, leading to a longer and very comprehensive analysis of all aspects in Step 3.

In Step 3 users assess how far conditions and criteria are actually fulfilled for the chosen activities. Collaboration among stakeholders is encouraged during the assessment process, drawing from experiences and knowledge of several experts. Separate tables exist for each development objective, respectively, with conditions and criteria relevant for their fulfilment. Only those tables which correspond to their selected development priorities are shown to the users (max. 3). Condensed results of the assessment are presented in Step 4, both as overview and in a more detailed form. Whenever conditions for basic functioning are rated as insufficient, users are prompted to think about remedies (what farmers could do for improvement) or measures that supporting organisations could implement.

The guide is useful for assessing the possible functioning of farmers' participation in existing value chains. It does not support the shaping of development objectives (assuming that these decisions have already been taken). Neither may this guide help in the process of developing new value chains. Numerous handbooks exist for that purpose already. The above description shows the main focus of the guide: helping stakeholders assess the conditions of successful participation in various possible income generating activities. This cannot be viewed in isolation - it needs to be embedded in a process which starts from situation analysis of a certain region and related stakeholder analysis, the definition of development objectives and an initial selection of several possible income generating activities to be assessed. The guide starts at this point, and it may prompt more detailed analysis of specific questions raised within. We consider that performing the assessment leads actors to adopt a system perspective when making subsequent decisions on diversification options.

Step 4 and Step 5 in particular give hints for measures to be planned for future implementation of the choices made. Embedding the guide in a well-defined and structured consultative process is envisaged for a future project.

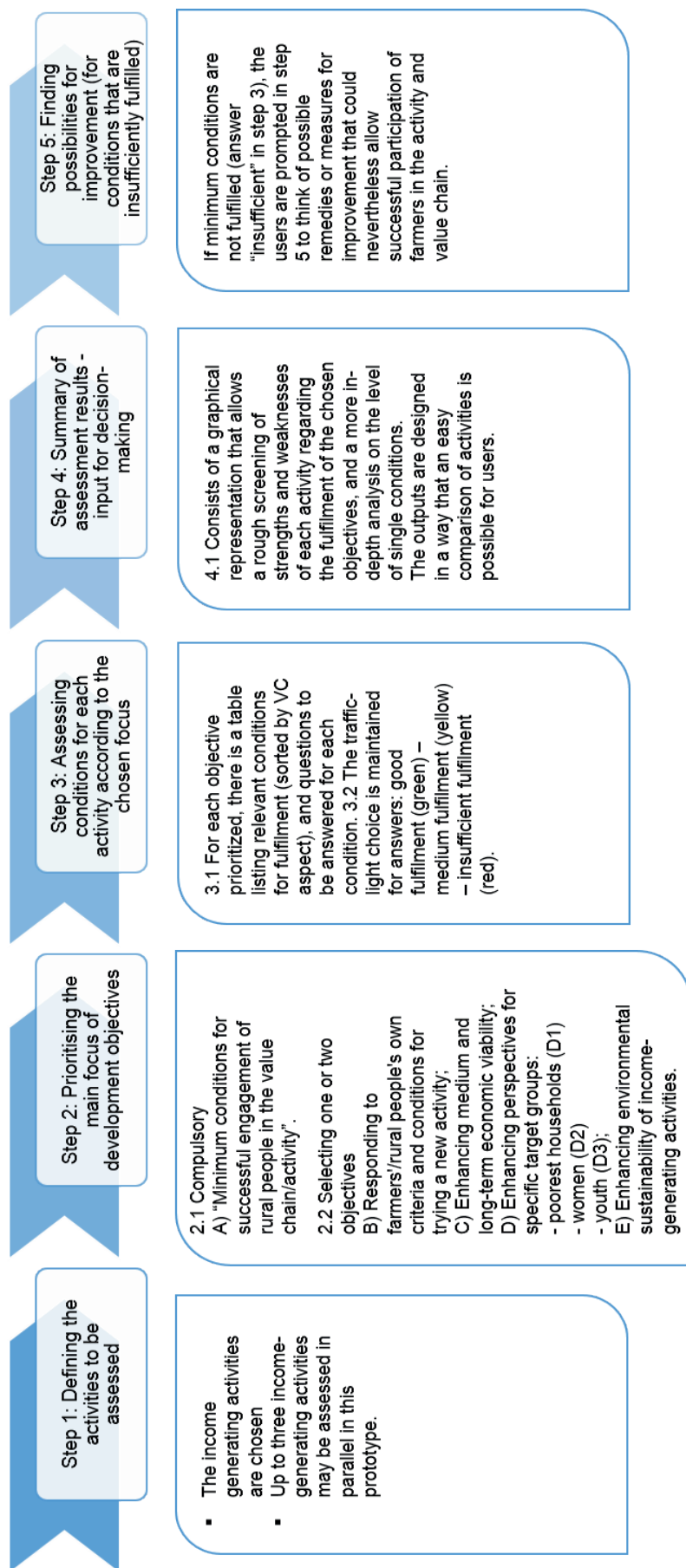


Figure 2. Steps of the guide explained

Discussion

Diversification as a strategy for improving rural livelihoods of smallholders

In our study we assume that diversification is a desirable strategy for maintaining and/or increasing livelihoods. This is briefly discussed here with respect to overall VCD strategies and the household level. Analysis in the literature usually focusses on the effects of diversification (versus specialisation) on poor households. Little could be found regarding the role of diversification strategies for women or young people in particular. On the other hand, VCD projects that focus on a specialisation may rely on existing social networks (e.g. women's groups) for implementing activities for such target groups (Seville et al., 2011).

According to Altenburg (2007) threats for the rural poor are much greater and opportunities more limited where the domestic business sector is less competitive in general. Under such conditions Stoian and Donovan (2007) suggest a "multi-chain-approach" to minimise risks and increase the potential for poverty reduction through strengthening not only the most promising (export oriented) value chain but a variety of domestic or regional chains to which smallholders have access. Similarly, Charette (2011) calls for a "portfolio approach" to VCD programmes which should stretch across sectors, in particular if the agricultural sector is faced by high price and weather risks (however, other approaches rather than VCD could serve better in such situations). Stoian et al. (2012) argue that a complementary focus on rural infrastructure and services, food security, and local markets for traditional products are a necessary part of comprehensive rural development strategies.

Seville et al. (2011) observes in irrigation development projects in Africa that specialisation has come with a "vertical model of governance" which set aside traditional groups' solidarity, an aspect of particular importance to very poor farmers. Furthermore, they state that extension which focuses on production of a specific crop falls short of the needs of women and youth in particular – people who need to build up their economic and social assets. Diversification has a major role in these aspirations. They propose a shift in the role of extension; it should reflect farming as a whole, serving as facilitator between actors and thus assist networking and participation in collective decision-making and in advocating their own needs and rights.

Findings of Mendéz et al. (2005) suggest that integration of farmers in fair trade coffee value chains in Latin America raises incomes but correlates with increased food security only if combined with diversification. Crop diversification, in turn, helped farmers increase soil fertility, while some farmers reported a 50% drop in soil fertility through mono-cropping their only cash crop.

Hoeffler (2011) could not attribute increased livelihoods of rural households in Kenya to either specialisation or diversification. Both strategies might be successful, depending on many different factors. However she observed that all successful "poverty exiters" had mixed farms, and she recommends that value chain promotion should take this into account. In addition, she has collected evidence that household life cycle factors might be at least equally important for escaping poverty as the

production strategy chosen. Her findings highlight that evaluation of VCD impacts is insufficient if relying on household panel data only as it leads to misleading conclusions – in-depth narratives of individuals show the variability of causes for both improvements and deteriorations.

In the context of increasing demands towards suppliers in many value chains all over the world, there are also good arguments for specialisation. It is obvious that diversifying activities also means diversifying attention and time, whereas necessary improvements in product and process quality in particular require specialised know-how and attention to detail when producing or processing a particular product.

In the literature many examples of the beneficial effects of diversification may be found, both regarding environmental and socio-economic criteria. However, cause-effect relationships are by no means clear in these complex scenarios, and it is necessary to take into account the specific livelihoods situation in each case. Most studies compare an earlier diversified farm household situation with their situation after integration into a cash-crop value chain. Our setting implies a reverse change, and it can be assumed that some of the advantages of diversification described cannot be replicated anymore or only over a long period of time. In any case we do not see our contribution only in the context of diversification strategies; it could also serve for other purposes and in various types of decision-making processes, even when considering specialisation and VC upgrading.

Limitations and difficulties encountered

Diversifying income sources on the small-scale farms requires consideration of the associated risks, which may be measured e.g. in terms of exposure to credit (debt), suitability of producing a particular product in a selected area, other players in the market, level of technology required for the new business, price and volume volatility of the market, number of buyers, cohesion of the group, and access to technical and financial services. Risk management is based on having sufficient information to make an informed decision. If the likely investment is low, less information is required than if the investment is high (Kahan, 2008).

Knowledge is an asset that people accumulate and develop. However, cultural and mental barriers that give less value to information and knowledge compared to physical and financial assets may adversely influence the effectiveness of this tool, especially among smallholder producers in remote rural areas. This is why the tool is designed firstly for facilitators (e.g. extensionists) with the attitude, commitment and skills to overcome these barriers, who incorporate farmer experiences and also provide direct support and close follow up in the implementation of this tool.

Aspirations to simplify strategic planning processes and develop tools for use by practitioners are not new. While it is recognised that providing stakeholders with a tool does not replace a fully-fledged extension system, long-term rural development programme or targeted policy interventions, a central characteristic of such guides or tools is the meandering between in-depth analysis and the need for concise, quick handling and results. If very complex, various practitioner groups will not use them even though they produce high-quality results. Furthermore, in many cases it would be

a great challenge to collect sufficient and reliable data for e.g. mathematical models or scenarios. If too pragmatic, the risk of arriving at questionable conclusions is high. In both cases the instrument would be soon discarded. In our case, too, a compromise is to be found, and further transdisciplinary research is envisaged for that purpose. Technical implementation - starting from the choice of software to the design of specific operations and the internal processing of answers - requires many small decisions by the developers and needs verification. This applies in particular to Step 4 where results are summarised for users as input to their own decision-making. In this step the above-mentioned compromises have particular influence.

From a perspective of systemic change management it could be questioned whether such a tool is desirable at all, given its “mechanistic” outer character. We consider that the core quality of the tool depends on the assessment questions included - and hence on the way these are answered by users. It is of course possible to answer questions alone and based on very superficial knowledge or gut feelings. This replicates the character of any decision made with limited knowledge. Discussion with others is encouraged but not a must. It would be possible to make it an internet-based interactive tool, which again would come with its own advantages and disadvantages. An alternative is to better specify the process in which the tool should be embedded. Systems approaches would certainly play a central role here, in particular because it allows working with open and even paradox questions - a central practice in systemic consultation. In the assessment guide only closed questions are possible, otherwise it would be impossible to handle by stakeholders themselves.

In any case, some open issues and uncertainties will remain, and all parties - including farmers - should be made aware of these risks. In the context of VCD projects Stoian et al. (2012) conclude that for poor households an asset-based approach to VCD is necessary, including a careful analysis of the different assets available and changes thereof in the course of any project. For the purposes of our assessment guide this could imply an extra step at the beginning which allows a categorisation of target groups, which then results in variations during the following steps, depending on the chosen category. In its present state questions on assets are included among other conditions to be assessed. However, under the given circumstances and given the complexity of smallholders' situations it is considered impossible and impractical to determine concrete “minimum asset thresholds” for participation in a value chain. Instead, users are encouraged to define measures for improvement of any critical conditions by actors within or outside the chain. This will most likely include non-market measures such as customised technical assistance for building social and human capital, rehabilitation of eroded natural capital or investments in basic services or physical assets. Even where these are unlikely to be realised, users are made aware of their necessity, and may then decide if a participation in the envisaged value chain should still be tried without those support measures. The added value of the guide in this context is the awareness raised on critical factors for success, so that they can be monitored in particular.

Given the risks, small farmers should engage with new markets in a stepwise manner with test plots at first and market trials, before engaging in large scale supply. Groups

with more experience in marketing, i.e. those with more assets, savings and ability to act collectively, can take on higher risk.

Possible applications and further development

Users may feel that the assessment procedure is quite tedious. On the other hand, good decisions need careful assessment, both rational and using “gut feeling”. Obviously, the quality of the results is more reliable if users are able to answer all questions well. And collaborating with several experts will be very helpful in this process. Another possibility is to commission an external study on the basis of this guide - this has advantages and disadvantages to be considered. Given the variability of conceptual frameworks and methods used in such analysis so far, the primary function of the guide would then be to serve as a frame of reference when contracting external researchers or consultants who can be asked to work with it.

However, an interesting challenge for further development is to combine this Excel based format with other knowledge based tools in customary ways, resulting in a robust management tool that simultaneously evolves to a point where it can be easily implemented by value chain smallholders themselves.

The tool has potential to contribute to the development of public policy strategies. The information generated can be systematised in a database; from the database it is possible to classify the main activities for small farmers. With this information the government is able to design specific support measures which contribute to successful activities selected by small farmers. Another possible application of the tool is the exchange of information from different countries.

For the moment the use of the guide for an ex-post evaluation of decisions made is very limited. This is due to the need for pragmatism in particular. Any intervention to be evaluated will come with more specific objectives than the overall foci used here, and hence require a set of corresponding indicators. The questions and conditions included in the assessment are no replacement for well-formulated indicators. However it might be tried to modify the framework in a way that would allow working with more concrete objectives and indicators. This would most likely lead to multiple versions with a narrower range of users and uses for each of them, and increased complexity of handling.

Resume

For farmers and other rural people, diversification of income generating activities involves making decisions in complex situations. Approaches to develop a decision support tool require inclusion of actors’ own criteria and a heuristic methodology, in accordance with the characteristics of the decision situation. Furthermore, a value chain and systems view needs integrating, as well as an asset focus for vulnerable groups. The main challenge: accounting for complexity but being simple in use. Finding the minimum conditions for participation is central for assessment, criteria for other development objectives are subordinate to basic functioning.

The tool described here has a specific and limited place in decision-making. It needs embedding in a consultative process with flexibility to adapt it to different situations and users - hence a transdisciplinary approach to its development is the logical consequence. Crucial features to be tested are the phrasing of assessment questions, the design of the ensuing analysis and the condensed presentation of results to users. More documented experience using this type of tool in participatory assessment of diversification strategies would be helpful in this context.

This tool illustrates how capturing local knowledge and conveying it to the decision-making level may enable the diversification of activities. It looks at risks and vulnerabilities that help to prevent decision failure and engages to develop successful economic activities. However, the usefulness of the tool depends on the level of participation of those involved and the available knowledge about possible activities to develop.

This tool provides the opportunity for location specific knowledge utilisation and transfer that might lead to genuine and effective public policy strategies. Its demand driven orientation fosters improved decision making capabilities and negotiation power of actors in value chains, particularly of smallholder producers. It might also contribute to link these smallholders to differentiated markets and to risk management (market, climate and institutional). A less tangible benefit of this tool is to improve value chain actors' awareness of the importance of information and knowledge as an asset especially among small producers and their organisations. It remains to be seen to what extent policy makers and supporting organisations may formulate appropriate measures where such a need is identified in the process.

References

- Aenis, T., Hofmann-Souki, S., Nagel, U.-J., Tang, L., Wang, J. (Eds.) with contributions by Cruz Moreno, S.I., Cutler, J., Larson, M., Liebig, G., Longanecker, J., Kinkel, C., Kübke, L., Martin, F., Ohlendorf, K., Ridder, R., Rodriguez Jardines, K., & Sim, L.M. (2013). Rubber cultivation and livelihood - a stakeholder analysis in Xishuangbanna, Southwest China. HumboldtUniversität zu Berlin. Online: urn:nbn:de:kobv:11-100216241.
- Altenburg, T. (2007). Donor Approaches to Supporting Pro-Poor Value Chains. German Development Institute. Bonn.
- Bartosch, S., Dusold, P., Lee, J., Liao, D., Lüdiger, J., Maier, K., Mayr, S., & Yuniarti Prativi, S. (2015, unpublished): Sustainable rubber cultivation in Xishuangbanna: an empirical study on farmers' willingness to accept land-use changes. Report, Humboldt-Universität zu Berlin.
- Charette, D. (2011). A Portfolio Approach to Value Chain Development Programmes, MicroREPORT #169, USAID, Washington, DC.
- Currle, J., Kühn, A., Hofmann-Souki, S. (2014). Portfolio Review zur Evaluierung der Förderung landwirtschaftlicher Wertschöpfungsketten in der deutschen Entwicklungszusammenarbeit. FAKT Consult for DEval GmbH (unpublished).
- Donovan, J., Cunha, M., Franzel, S., et al. (2015). Guides for value chain development. A comparative review. *Journal of Agribusiness in Developing and Emerging Economies* 5 (1): 2-23.
- Donovan, J., & Poole, N. (2011) Asset building in response to value chain development: Evidence from specialty smallholder coffee producers in Nicaragua. ICRAF Working Paper 138, World Agroforestry Centre, Nairobi, Kenya.
- Dörner, D. (1989). Die Logik des Misslingens. Strategisches Denken in komplexen Situationen. Rowohlt, Reinbek.
- Guèye, B. (2014). Specialisation or diversification? Divergent perspectives on rice farming in three large dam-irrigated areas in the Sahel. International Institute for Environment and Development, London, UK
- Häuser, I. Martin, C., Germer, J., et al. (2015). Environmental and socio-economic impacts of rubber cultivation in the Mekong region: challenges for sustainable land use. *CAB Reviews* 2015 (10), No. 027.
- Hoeffler, H. (2011). Specialisation or Diversification? Poverty Exits and Agricultural Value Chains in Rural Kenya. Poster presentation at the Poverty Reduction, Equity, and Growth Network (PEGNet) Conference 2011 "Poor countries, poor people, and the new global players", at the GIGA German Institute of Global and Area Studies, September 7-9, Hamburg, Germany.
http://www.pegnet.ifw-kiel.de/research/grants/results/hoeffler_specialisation-or-diversification
http://www.pegnet.ifw-kiel.de/members/events/presentations2011/hoeffler_poster/view. Accessed March 2016.

- Humphrey, J., & Navas-Alemán, L. (2010). Value chains, donor interventions and poverty reduction: a review of donor practice. IDS Research Report 63, IDS, Brighton, UK.
- Humphrey, J., & Schmitz, H. (2002). How does insertion in global value chains affect upgrading in industrial clusters? *Regional Studies* 36(9): 1017-1027.
- Kahan, D. (2008, 2013): Managing risk in farming. FAO. Rome, Italy.
- Liu, W., Hu, H., Ma, Y., & Li, H. (2006). Environmental and socioeconomic impacts of increasing rubber plantations in Menglun Township, Southwest China. *Mountain Research and Development* 26: 245-53.
- Lundy, M., Becx, G., Zamierowski, N., Amrein, A., Hurtado, J.J., Mosquera, E.E., & Rodriguez, F. (2012). LINK methodology: a participatory guide to business models that link smallholders to markets. Centro Internacional de Agricultura Tropical (CIAT), Cali, Colombia (CIAT Publication No. 380).
- McKague, K., & Siddiquee, M. (2014). Making Markets More Inclusive. Lessons from CARE and the Future of Sustainability in Agricultural Value Chain Development. New York: Palgrave MacMillan.
- Méndez, V.E., Bacon, C., Petchers, S., et al. (2005). Sustainable coffee from the bottom-up: impacts of certification initiatives on small-scale farmer and estate worker households and communities in Central America and Mexico. Boston: Oxfam America.
- Mutua, E., Njuki, J., & Waithanji, E. (2014). Review of gender and value chain analysis, development and evaluation toolkits. ILRI, Nairobi, Kenya.
- Riisgard, L., Escobar Fibla, A.M., & Ponte, S. (2010). Gender and Value Chain Development. Evaluation Study. The Danish Institute for International Studies (DIIS), Copenhagen. DANIDA.
- Scoones, J. (1998). Sustainable Rural Livelihoods. A Framework for Analysis. IDS Working Paper No. 72.
- Seville, D., Buxton, A., & Vorley, B. (2011). Under what conditions are value chains effective tools for pro-poor development? Report, International Institute for Environment and Development/Sustainable Food Lab.
- Stoian, D., Donovan, J., et al. (2012). Value chain development for rural poverty reduction: a reality check and a warning. *Enterprise Development and Microfinance* 23(1): 54-69.
- Stoian, D., & Donovan, J. (2007) Value chain development from a livelihoods perspective: a multi-chain approach for coffee and cacao producing households in Central America. In E. Tielkes (Ed.) *Utilisation of Diversity in Land Use Systems: Sustainable and Organic Approaches to Meet Human Needs*. Tropentag, Kassel-Witzenhausen, Germany, 9–11 October 2007.
- UNIDO (2011). Pro-poor Value Chain Development: 25 Guiding Questions for Designing and Implementing Agroindustry Projects, United Nations Industrial Development Organisation, Vienna, Austria.

Tang, L. (2013). Knowledge Flows in Land-use Change through Institutional Innovations and Plant Breeding: Case Study from Nabanhe National Nature Reserve in South-West China. *Kommunikation und Beratung* 111. Margraf, Weikersheim.

Xing, L., & Song, L. (2010). Rubber Expansion in Xishuangbanna. Discussion Paper, RCSD/ChATSEA International Conference "Revisiting Agrarian Transformation in Southeast Asia". 13-15 May 2010, Chiang Mai, Thailand.