

Modelling Options for Policy Impact Analysis on African Dairy Farms

Oghaiki Asaah NDAMBI

*IFCN Dairy Research Center at the Department of Agricultural Sciences
University of Kiel
Schauenburger Str. 116, 24118 Kiel, Germany*

Abstract. Studies on the priorities for agricultural research in Eastern and Central Africa concluded that milk is the most important commodity for research and development in the region, based on its potential contribution to the agricultural GDP. It has been presumed that, the right policies, marketing systems and technical support must be sought for dairy development in Africa. In order to determine the right development pattern, appropriate analytical tools must be applied. The TIPI-CAL (Technology Impact Policy Impact model) was used to analyse the impact of different policies on two typical dairy farming systems in Uganda, which account for more than 70% of milk produced in the country. Seven influential policy areas were also identified: provision of veterinary services, consumption promotion, marketing promotion, input provision, credit access improvement, milk quality improvement and genetic improvement. In general, the policy impacts are very little on farms with local cows but can be magnified up to threefold, if the farms have graded cows. Policies which improve farmers' accessibility to markets have the greatest impacts. The results obtained from this model were compared to those using the EXTRAPOLATE model. This comparison shows that both models could complement each other in analysing policy impacts on African dairy farms. However, differences in results from the models indicate that more focus should be made on farmers' willingness to adopt new technology.

Key words: Africa, Dairy farms, EXTRAPOLATE, Policy impacts, TIPI-CAL

1. Introduction

Malnutrition is still a major problem in Africa and milk has been envisaged as a major protein source that can improve nutrition in Africa (Meyer and Denis, 1999). There is a growing interest in dairy development as a tool for empowering rural families by improving on milk consumption within these families and also increasing their farm income from dairying (FAO/IDF, 2005; NEPAD, 2004; Ahmed et al., 2004). Studies on the priorities for agricultural research in Eastern and Central Africa concluded that milk was the most important commodity for research and development in the region, based on its potential contribution to agricultural GDP (ASARECA/IFPRI 2005). According to Staal (2004), cattle ownership improves child nutrition either by increased milk consumption or by increased family income. He also highlighted that, for a better realisation of these potential benefits, more understanding is needed firstly, on allocations of milk and control of resources within households and, secondly, on policy directions that encourage milk availability and consumption (Staal, 2004). In Kenya, for example, the small-scale specialised dairy production system has witnessed enormous growth over the past years, due to the huge adoption of policies favouring this system (Thorpe et al., 2000). Several policies have been suggested for development of the dairy sector of African countries, with each country laying emphasis on different parts of the dairy chain

(Ndambi et al, 2007). Most policies sprout from a concept that the dairy sector will realise a great impact if production and productivity of milk are increased at the national level, thereby reducing imports (Ngwoko, 1986). The decrease in funds from sponsors over the years and the desire to cover a broader scope has pushed policy makers to be more cautious in project expenses. This therefore implies that there is a need for understanding on the best policies and/or technical support services which support organisations can apply in order to improve on dairy production while maintaining minimum investment. For selection of these policies and support services, adequate analytical tools must be developed and applied especially in typical African agricultural systems where farms are very complex units. The TIPI-CAL (Technology Impact Policy Impact Calculations model) was used for analysing and ranking the impact of various policies and farm strategies on typical dairy farming systems in Uganda. The results obtained from this model are compared to those using the EXTRAPOLATE (EX-ante Tool for RAnking POLicy ALTErnatives) model in view of improving on the methodology for future research on policy impacts on African dairy farms.

2. Model description

The EXTRAPOLATE model

EXTRAPOLATE (EX-ante Tool for RAnking POLicy ALTErnatives) is a communication tool based on possible policy impacts. For any application, the user has to define the situation as it is now, before any policy intervention has been made. EXTRAPOLATE arose out of the need for a decision support tool to assess the impact of different policy measures. The tool facilitates discussion of the relevant issues and enables users to visualize the predicted impacts of policy interventions, based on a simple numerical analysis (Thorne et al., 2005).

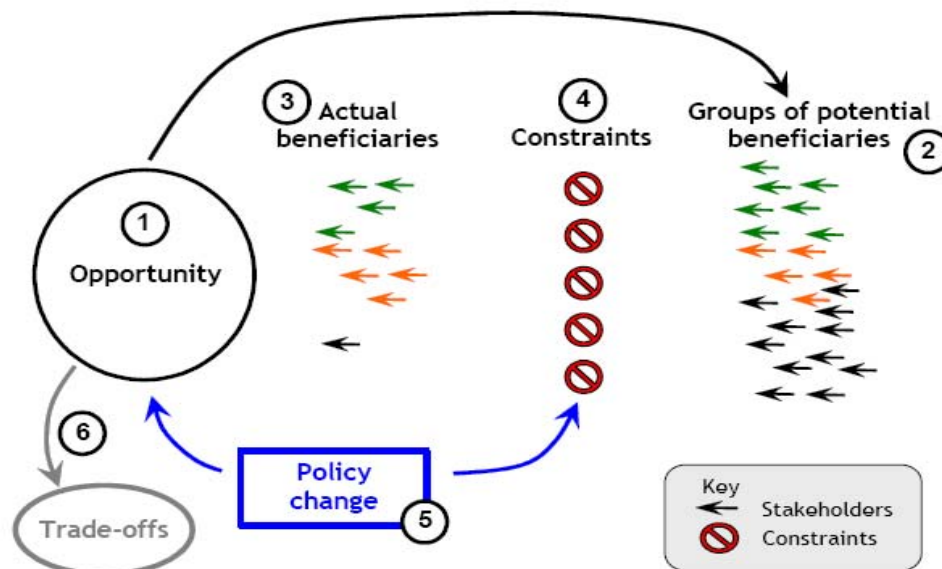


Figure 1. Basic framework of the EXTRAPOLATE model

Source: Thorne et al: 2005

The purpose of EXTRAPOLATE was selected as it is a rapid screening device, to allow the user to carry out quick assessments of likely candidate policy changes that may have particularly beneficial impacts on the poor in particular situations, the most promising of which can then be analysed further using much more rigorous (and time- and data-intensive) methods. The tool has the further characteristic that it is participatory in nature, encouraging stakeholder involvement and discussion around the likely impact of policy change. This model is made up of various elements (Figure 1), and various linkages among the elements. In an overview, the procedure starts from the identification of an opportunity (1), identifying potential beneficiaries from this opportunity (2), finding the actual beneficiaries (3) and determining the constraints of all potential beneficiaries from benefiting (4), before finding policies which could influence them and to what extent (5). The key elements include the stakeholder groups, constraints faced by these stakeholder groups, outcomes and policies.

The TIPI-CAL model

The TIPI-CAL model (Hemme, 2000) is a production and accounting tool which was developed by the International Farm Comparison Network (IFCN). It applies the concept of typical farms, where a typical farm represents the most common farm type within a production system which has an average management and performance and produces the largest proportion of milk.

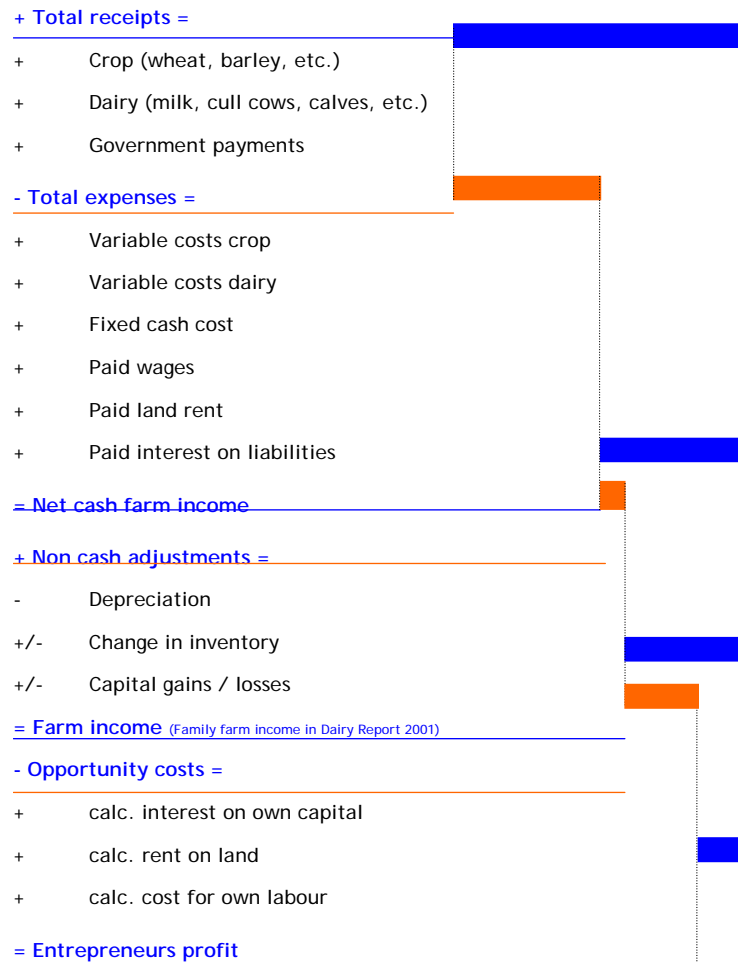


Figure 2: Farm economic indicators of IFCN method

This approach of typical farms and panel approach has been proven to be very practical and to produce in-depth results at the international scale (Isermeyer et al. 2003). The original model (version 1.0) was developed by Hemme (2000), and since then, has been refined to suit its applicability on a global scale. This study applies the TIPI-CAL model (version 4.0) which was modified to suit its applicability on small-scale dairy farms. This version was further developed in the years 2005-2006 to better represent the complexity of small-scale dairy farming using a whole household approach comprising off-farm, crop farm and dairy farm enterprises.

The farm economic analysis using the TIPI-CAL model runs through a number of indicators as illustrated stepwise in Figure 2. The net cash farm income is obtained by deducting total expenses from total receipts. From this, non-cash adjustments are made. In addition, the opportunity costs of farm-owned factors are deducted to give the entrepreneur's profit. The cost calculations of the dairy enterprise consist of the following elements: milk production, raising replacement heifers and forage production and/or feed purchased for dairy cows and replacements. The analysis results in a comparison of returns and total costs per 100 Kg of milk produced on the farm.

Methods for comparison

The EXTRAPOLATE analysis uses *Livelihood status* as the unit for ranking policies. In general, it takes into consideration the factors that can affect the wellbeing of stakeholders. For this study, the following factors contribute to the livelihood status: production and sales of dairy products, profit margins, security of livestock asserts nutrition status, employment opportunities, and environmental degradation. For the TIPI-CAL model, the *Household Income* has been selected as the closest parameter to livelihood status as in the EXTRAPOLATE model. The household income includes: dairy income, off farm income and other farm (crop and animal) income. The TIPI-CAL model analysis was done by splitting each policy into a number of scenarios as described by stakeholders. The final results presented are obtained by averaging the results of individual scenarios for each policy area. This was to ease the comparability of the results with those of the EXTRAPOLATE, since the EXTRAPOLATE only presents one scenario per policy.

Results from TIPI-CAL model

In general, the policy impacts are very little on extensive dairy farms, which are the most typical farms in the region. These results can however be magnified up to threefold, if the farms have graded cows. Policies which improve farmers' accessibility to markets have the greatest impacts on the livelihoods of farmers, through improved income generation from dairying. Genetic improvement of cattle breeds is recommended as an initial strategy, which can improve the impact of other farm policies. The adoption of graded breeds and appropriate technology could be facilitated by farm credits. However, at current interest rates of 4% per month, obtaining credits for genetic improvement will double the cash costs of the farm, hence discouraging farmers from this investment. Hence, a set-up with a more incentive-based environment is required to support such private initiatives and the adoption of intensive farm technologies.

Results of comparison of two models

The results from both models have been presented side by side in Table 1 and on Figure 3 below.

Table 1: Ranking of policies by extent of impact (1 = best policy)

Policies	EXTRAPOLATE		TIPI-CAL	
	Smallholder	Medium holder	Smallholder	Medium holder
1. Genetic+	7	7	1	1
2. Vet services	1	1	5	5
3. Marketing+	3	2	3	3
4. Quality control	6	6	7	7
5. Cons promotion	2	2	2	2
6. Input access	4	4	4	4
7. Credit access	5	5	5	5

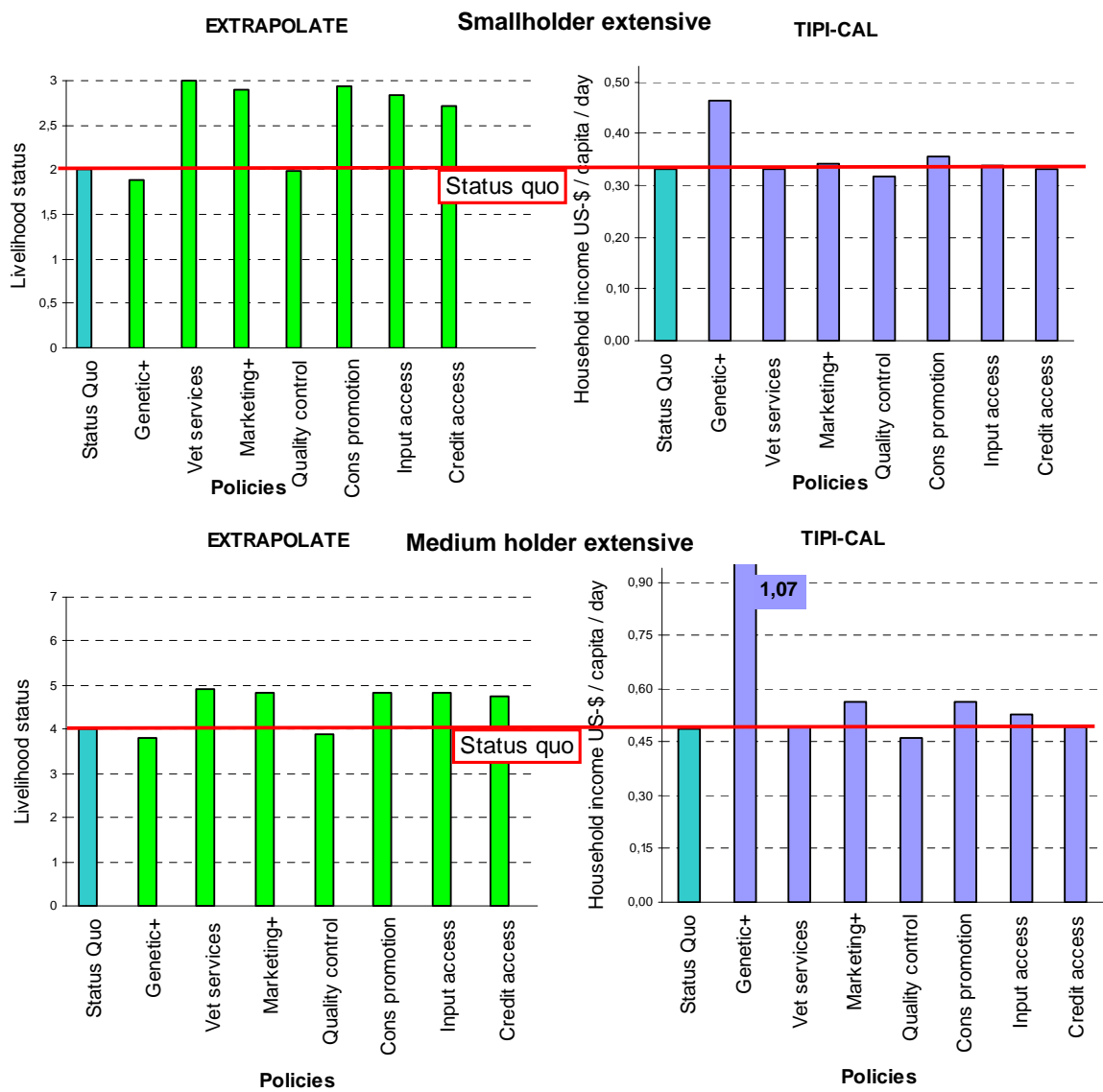


Figure 3: Policy impacts on smallholder and medium holder extensive farms

3. Elaboration of results

1. Genetic improvement

While the results from the extrapolate model show that the implementation of genetic improvement policies will bring about a reduction in the livelihood status of the small and medium farmers, the TIPI-CAL model showed that these policies will greatly improve on the household incomes of the same farmers, hence their livelihood status. According to the EXTRAPOLATE, the negative impact is due to: higher input costs and labour input with improved breeds, increased exposure of improved breeds to theft and hence reduced security of livestock resources and increased susceptibility of animals to diseases. The TIPI-CAL also considered these aspects and after assignment of numerical values, the overall impact is positive.

2. Veterinary services

From the extrapolate method, improvement on the provision of veterinary and extension services would increase the livelihood status of the small scale extensive and medium scale extensive farmers by 67.5% and 33.75% respectively. With the TIPI-CAL, this same policy does not show any impact on the farmers. Discussions with farmers show that they won't go in for more vet expenses, even if they could reach these facilities easier or even at a half price. This is because they didn't find any benefit from further investments on their local animals, which already had some resistance to natural conditions and were not productive enough to be allocated higher vet costs. Therefore the EXTRAPOLATE analysis did not consider the farmer's willingness in this case. Farmers also confirmed a substantial impact from extension services by public veterinarians, which the TIPI-CAL analysis didn't show.

3. Marketing improvement

Marketing improvement policies lead to an increase of livelihood status by 45% and 21% for the small and medium farms respectively, using the extrapolate model. The same policies bring about an increase by only 3.3% and 15.9% respectively, in household incomes of the same farmers with the TIPI-CAL model. The extrapolate analysis shows that marketing policies have a greater impact on the smallholder farmer than on the medium farmer; meanwhile the TIPI-CAL shows a greater impact on the medium farmer. This difference could be explained by the fact that, extrapolate also considers the relevance of the impact of policy implementation on stakeholders while the TIPI-CAL only shows the potential impact on stakeholders. Therefore with extrapolate, the same policy could show a higher impact on stakeholders with a greater need for the given change than to those who have less need. This could be so, even if the real impact (for example increase in income) is greater on the stakeholders with less need. This method is of importance especially when qualitative assessments intended for poverty alleviation are targeted. However, if the benefits are to be assessed on a quantitative basis, the TIPI-CAL approach will show more.

4. Quality control

The results from the extrapolate model show that the implementation of a milk quality control policy will slightly reduce the livelihood status of the small and medium farmers. The TIPI-CAL model showed the same policy impact, though the basic assumptions for both methods varied slightly. In the TIPI-CAL approach, adulteration was seen as a major cause of poor quality milk, hence its elimination was seen very helpful in quality control. Meanwhile the extrapolate approach considered production and marketing constraints.

5. Consumption promotion

Both models reveal that the implementation of policies that enhance milk consumption will bring about a positive impact on both the small and medium farmers. However, the EXTRAPOLATE analysis showed a much higher impact (46% and 21% respectively) as compared to 6% and 23% with the TIPI-CAL model. As with marketing policies, EXTRAPOLATE shows a higher impact on small farmers than on the medium farmers due to the relevance of the policy impact to small farmers.

6. Input access

The implementation of policies that improve small and medium farmers' access to farm inputs has a positive impact on the farmer, using both models. However, there is a higher impact (+42% and +21% respectively) using the extrapolate model than with the TIPI-CAL model (+0.6 to +15.2), for the same reasons as in the previous case.

7. Credit access

According to the analysis using extrapolate; credit provision will increase the livelihood status of small and medium farms by 36 and 18% respectively. The TIPI-CAL model showed that, for the same policy there was no impact on both small and medium farms. The difference in this case probably comes from the perception of the panel on credit access. Credit access could be looked upon from two points of view: making credit institutions and formalities reachable to farmers and secondly making interest rates affordable to farmers. Discussions with farmers show that, at the current interest rates (about 14% per annum), these groups of farmers will not take loans even if credit institutions are at their disposal. This was the case as shown by the TIPI-CAL model. On the other hand, the same farmers will take loans if the interest rates were halved to 7%, which will prompt them to expand the farm and realise a positive change in livelihood status as revealed by the EXTRAPOLATE model. One major difference which we can observe from this case is that the TIPI-CAL model equally considers restrictions due to farmer adoption of the given policy, meanwhile the EXTRAPOLATE only shows the potential benefit of farmers and society if the policies were implemented and adopted.

The key conclusions from this study are as follows:

- Policy impacts with the EXTRAPOLATE model are bigger than those of the TIPI-CAL model
- Ranking of policies within each of the two models is the same for the smallholder extensive farms as with the medium holder extensive farms
- Ranking of policies 3 – 7 (Table 1) gives the same order in the two models
- Two policies (Genetic+ and Vet services) give completely opposite results in the two models

4. Proposal for a future analysis method

From all understanding, both methods have a strong background on policy analysis, though each has strengths and weaknesses. Most of the differences are based on approach, since both methods use the panel approach in evaluating policies. The perceptions of panel members are guided by their past experiences, which will differ among a group of experts and between different expert groups. This can strongly influence the outcome of the analysis especially when several outcomes could result from the implementation of one policy. To reduce errors from this, it is therefore advantageous to have the chance of creating scenarios so as to show and explain each possible outcome separately as is the case with the TIPI-CAL model.

In general, the EXTRAPOLATE model identifies stakeholders and influential policies and also provides a general picture of policy impacts, enabling ranking with strong emphasis on societal benefits and little on farmer adoption possibilities. The model however, does not reveal policy impacts in real terms for example, actual change in family income (\$), actual change in herd size (number of cattle), etc. The TIPI-CAL model on its part does not identify stakeholders and policies, but provides a more detailed policy outcome of known policies in real terms and does ranking with strong emphasis on farm benefits and farmer perceptions. Suggestions for an ideal future analysis method will be to first of all identify stakeholders and policies and get a general ranking of policy impacts using the EXTRAPOLATE model and secondly to do a more in-depth analysis to have a real quantification of policy impacts at farm level, using the TIPI-CAL model. This approach will not only be time and money saving, but also efficient as large amounts of data are produced within short periods. However, more emphasis should be laid on the farmers' willingness to adopt the new technology so as to improve on the validity and applicability of results.

References

1. Ahmed MA., Ehui S. and Assefa Y. 2004: *Dairy Development in Ethiopia*. EPTD Discussion Paper No. 123. International Food Policy Research Institute. Washington, DC 20006 U.S.A. <http://www.ifpri.org/divs/epid/dp/papers/eptdp123.pdf>
2. ASARECA/IFPRI 2005: *Strategic Priorities for Agricultural Development and Agricultural Research-for-development in Eastern and Central Africa*. Association for Strengthening Agricultural Research in Eastern and Central Africa. ASARECA, Entebbe. http://www.foodnet.cgiar.org/SCRIP/docs&databases/ifpriStudies_UG_nonScrip/pdfs/Strategic_priorities_for_ASARECA/main%20report%20-%20text.pdf
3. FAO/IDF 2005: *Dairy Development Newsletter*. No.9, p2
4. Hemme T. 2000: *Ein Konzept zur international vergleichenden Analyse von Politik- und Technikfolgen in der Landwirtschaft*. Landbauforschung Völknerode, Sonderheft 215. 284pp
5. Isermeyer F., Hemme T. and Holzner J. 2003: *Analysis of international competitiveness of milk production in the framework of IFCN*. Agric. Econ. – Czech, 49, 2003 (2) 94 - 100
6. Meyer C., and Denis J.P. 1999: *Elevage de la vache laitière en zone tropicale*. Montpellier, CIRAD, Collection Techniques, 314 pp.
7. Ndambi O.A., Hemme T. and Latacz-Lohmann U. 2007: *Dairying in Africa - Status and recent developments*. Livestock Research for Rural Development. Volume 19, Article #111. Retrieved August 11, 2007, from <http://www.cipav.org.co/lrrd/lrrd19/8/ndam19111.htm>
8. NEPAD (New Partnership for Africa's Development) 2004: *Smallholder dairy development project*. Government of the republic of Zambia:
9. <http://www.fao.org/docrep/008/ae709e/ae709e00.htm>
10. Ngigi M., Delgado C., Staal S.J., and Mbogoh S., 2000: *Role of Market Outlet in Determining Terms for Milk Sales by Smallholders in Kenya*
11. http://www.odi.org.uk/rapid/Bibliographies/SDP/Abstracts/SDP_Abs_030.html
12. Staal S. 2004: *Improved Child Nutrition through Cattle Ownership in Kenya*.
13. *Smallholder dairy project - Policy Brief*. <http://www.smallholderdairy.org/publications/Policy%20briefs/SDP%20BRIEF%205-FINAL%20R.pdf>
14. Thorne P., Thornton P., Robinson T. 2005: *EXTRAPOLATE, a discussion-decision support tool for assessing impacts of policy changes on the poor*. PPLPI User Guide, FAO, Rome, Italy.