Sida Evaluation 07/29

The Research Cooperation for Livestock Based Sustainable Farming Systems in the Lower Mekong Basin (MEKARN)

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Executive Summary

Cambodia, Laos, Thailand and Vietnam are cooperating within animal production research in a regional network, the Research Cooperation for Livestock Based Sustainable Farming Systems in the Lower Mekong Basin (MEKARN). Sida has contributed SEK 19.5 Million for 2001–2003 and 32.5 Million for 2004–2007. This evaluation covers the on-going four year period.

MEKARN originates in an international MSc programme, started by the Swedish University of Agricultural Sciences (SLU) in 1989, and in one component of the Sida supported bilateral research cooperation in Vietnam, both oriented towards "Sustainable Livestock Based Farming Systems". In the late 90-ies, the two were used for creating the MEKARN, embracing Cambodia, Laos, Thailand and Vietnam. The wish was to strengthen regional cooperation in research, training and information on livestock as the epicentre of sustainable farming systems.

MEKARN development objectives are to contribute to poverty alleviation, and to improve the livelihood of poor farmers. In order to meet its development objectives, MEKARN has programme objectives in terms of capacity building and research. Cooperation takes form in MSc training, in PhD training and in networking, the latter comprising both workshops and research funding.

Of a total of 13 universities and research centres, who declared their interest to participate in the new network, eleven are still active. One in each country functions as the national programme coordinator. The Nong Lam University in Ho Chi Minh City acts as the regional coordinator, SLU as the international coordinator. All partners meet annually at Stakeholder Meetings. MEKARN has a Steering Committee, where the national, regional and international coordinators normally meet three to four times per year. A Scientific Research Committee, comprising international experts, allocates the MEKARN research grants.

Evaluation findings are that the effectiveness of the programme in terms of capacity building, i.e. mobilising a critical mass of researchers and enhancing the capacity of junior researchers through short courses, and through MSc and PhD training, is high. The research objectives, concerning sustainable technology development, regional cooperation in research, training materials and database production, and information sharing, have been almost fully met. The team therefore also finds that MEKARN has met its development objectives.

The impact of MEKARN operations on the research agendas of involved institutions is profound, moving the main orientation from commercial farming systems and practices towards the problems of smallholder farmers, poverty alleviation and sustainable, environment friendly farming systems. The impact on national research agendas, and on farming practices, regulations and credit availability for livestock production is more difficult to assess at a broader scale, although the impact on poor farmers in the region is assessed as high. MEKARN has had quite good impact on the employment of graduated students, and in terms of gender.

The relevance of the MEKARN programme is assessed as high in a regional perspective, and in a poverty alleviation perspective. It is also high in terms of environment, food safety and poverty alleviation, particularly as regards a more efficient use of locally available feed resources. The programme is in close concert with the CGIAR System Priorities 2005–2015, priority areas 3–5.

The sustainability of programme results is, in summary, above average. One question-mark concerns the possibilities for MSc:s and PhD:s to secure continued government employment on competitive salaries after the cessation of Sida support.

Assessing efficiency has been less straightforward. The team finds some cost levels on the high side, but has not managed to find relevant cases of reference. Listening to preferences at the regional or local level, there is an expressed wish amongst programme partners in the region to retain the present arrangement unchanged, although some costs are high. In summary, the team has no observations.

This evaluation has been asked to situate the MEKARN regional programme approach within the global context and debate on livestock based sustainable farming systems research, as a means to reduce poverty, both in a rural and an urban setting. The team concludes that while MEKARN is not in the research forefront as regards basic research and the use of the most modern experimental techniques, MEKARN seems to be well in the forefront of research as regards developing and adapting methods, techniques and other means of production of relevance for poor farming systems in the region.

The research studies produced are of high quality and relevance, their value being demonstrated by the publication of papers from the PhD-theses in well-recognised international scientific journals with high 2005 impact factors. In a global perspective, the regional research programme of MEKARN is also well in line with the CGIAR Millennium Development Goals, especially with respect to its focus on reducing poverty, improving food security, and improving the sustainability of resources and biodiversity and increasing income from livestock.

As for how to develop the research programmes in the future, the team finds scope for an increased focus on metabolic effects and physiological explanations to findings, and on toxins and contaminants in the food chain. There also scope for increasing attention to the links between livestock production and other farming systems than those in focus at present, for example agro-forestry. Further, there is reason to increase research on poultry and on aquaculture.

The team notes that, in a poverty perspective, MEKARN programme activities have affected regional farming practices considerably, thereby contributing to significantly improved farmer wealth. On the other hand, the broader dissemination of results to poor farming households at the national level is not yet secured. The principle to use alternative channels, such as Farmers' Associations and Women's Unions, may well be rational, but the dialogue with extension services should also be maintained.

The MEKARN type, livestock based farming systems have a potential to increase animal productivity and economic performance, while diminishing environmental degradation, particularly for poor farmers. As women are usually responsible for taking care of the smaller animal species, they are also those who may benefit most from the improvements that can be gained through MEKARN activities.

The evaluation should assess to what extent MEKARN has linked national research in the region with the regional and global debate and research agenda. The team learns that MEKARN research activities in Vietnam and Cambodia in different ways are linked both to the International Livestock Research Institute (ILRI) and to the International Centre for Tropical Agriculture (CIAT) regional programme. Linking MEKARN is also achieved through the publication in different for a of research papers from MSc theses and from PhD theses. Additionally, the team means that research findings could preferably be synthesised and used to develop policy briefs, booklets, etc. to be disseminated wider in the region. Also, databases and teaching materials could be produced on the basis of such publications.

As to bilateral research cooperation in Vietnam and Laos, there is some synergies in Vietnam but not in Laos. In Vietnam, additional components of the bilateral programme might better be continued in regional form. In Laos, MEKARN research could be better linked to the bilateral research programme and to the country programme, for example regarding the role of livestock in forestry development.

As to capacity building, the overall MEKARN contribution has been successful. The team sees the MEKARN approach as a valuable alternative to bilateral programmes for specific capacity building efforts, displaying advantages over the bilateral option as regards, for example, the choice of cost-

effective solutions and the regional integration effect that comes as a result of the work itself. As the capacity in some universities and research institutes, particularly in Laos and in Cambodia, is still low, MEKARN capacity building efforts should be continued, institutional capacity building being addressed more comprehensively in a next phase, particularly in Laos and Cambodia, both in terms of the number of participants and in other respects.

Although unable to report on any specific articulation of MEKARN effects and impact in national strategies and policies, the team finds good regional justification for this kind of research cooperation, the participating countries having several similarities and sharing constraints and needs. In addition, Sida resources might be combined with Thai and Vietnamese resources, available for academic cooperation with Laos and Cambodia, resulting in a regionally strengthened and expanded cooperation.

So-far, the MEKARN programme has involved both international and regional expertise in training programmes and research cooperation, but the contributions from regional teachers and researchers have increased over the years. This trend could continue in the near future. It might preferably be formulated as a goal, further to increase the contribution of lecturers and laboratory assistants from the region.

SLU has been successful in supporting and developing livestock research activities in the region in close concert with the global debate and research agenda. It has been suggested that the Nong Lam University take over the responsibility for the MEKARN MSc training and for awarding the degree. However, and in conclusion, the team supports the position of the MEKARN partners that the MEKARN MSc degree should continue to be awarded by SLU, not least for the value it has internationally.

The team recommends, inter alia, that the MEKARN continues in a third phase, is given a more comprehensive capacity building task, is strengthened in its regional dimension, is given an increased priority for Cambodia and Laos, has a continued gender objective, increases the share of lecturers from the region, and strengthens research on other farming systems, on poultry and on fish production.

1. Background

Since the year 2000, the four Lower Mekong riparian countries Cambodia, Laos, Thailand and Vietnam are cooperating within the area of animal production research in a regional network, the Research Cooperation for Livestock Based Sustainable Farming Systems in the Lower Mekong Basin (MEKARN). A total of 13 universities and research institutes in the four countries participated originally in the network, coordinated by the Nong Lam (Agriculture and Forestry) University at Thu Duc, Ho Chi Minh City, Vietnam, and by the Department of Animal Nutrition and Management at the Swedish University of Agricultural Sciences (SLU). The cooperation has been supported by Sida to the tune of SEK 19.5 Million for the first three-year phase 2001–2003 and 32.5 Million for the second period 2004–2007. The current financing agreement runs through December 2007.

As it was too early in 2003 to assess programme impact on development objectives, the first phase of cooperation was not evaluated by external evaluators. Instead, a desk assessment was made by Sida prior to programme extension into the current phase. In order to establish an independent view of performance and impact, Sida has now decided to evaluate the programme on the basis of the 2003 programme assessment. Sida's Terms of Reference for the evaluation are annexed, Annex 1. Annex 2 offers a list of acronyms and abbreviations. The evaluation was carried out during November and December 2006. The present report presents evaluation findings, conclusions and recommendations. The persons interviewed for the evaluation are presented in Annex 3.

2. The MEKARN

Programme Background

From 1989 to the late 90-ies, an SLU international MSc programme had accepted students from Vietnam and neighbouring countries, financed by SAREC (1992–1994) and by Sida (from 1995). On the basis of a sustainable production systems approach, different technologies suitable for resource-poor farmers in the region had been developed. Further, the SAREC and Sida supported bilateral research cooperation between Sweden and Vietnam of the same decade had a component "Sustainable Livestock Based Farming Systems", based at the University of Agriculture and Forestry in Ho Chi Minh City and supported by SLU. The main function of the two Sida contributions was to finance PhD and MSc training, and research projects in the subject area.

In the late 90-ies, it was concluded that the two programmes had created a strong base in Vietnam and had become well known also outside Vietnam, in fact together becoming one of the two leading global powerhouses in research on integrated tropical agriculture. A scope was seen to expand these programmes to embrace the whole region of the Lower Mekong Basin (Cambodia, Laos, Thailand and Vietnam). It was assumed that such an expansion would benefit all participating countries, as the different centres all have much to contribute to, and gain from, such a network.

The idea was supported by the fact that Sida's country strategies for the region all emphasised a change in focus towards research and assistance to the rural poor. Three large Sida area development programmes in the region all aimed at finding sustainable livelihoods for resource-poor farmers. New knowledge on farming systems, based on research findings, was assumed to be important for the three programmes. It was also assumed that the proposed research cooperation could play a key role in training local researchers, who might be attached to the programmes, and in an exchange of ideas and experiences between the countries concerned. It was also felt that existing agriculture research and training had a bias towards large scale conventional livestock based production systems, which had proved to be successful in industrialised countries but less relevant for smallholders in developing countries. The wish was instead to strengthen regional cooperation in research, training and dissemination of information on livestock as the epicentre of sustainable farming systems.

The idea to establish a regional cooperation with such a focus was discussed among invited researchers from Vietnam, Laos, Cambodia and Thailand in January 2000. Support was unanimous. The Nong Lam University in Ho Chi Minh City offered its services for the function of regional coordination.

Setup

The following universities and research centers declared their interest to participate in the network:

Cambodia: Royal University of Agriculture (RUA), Phnom Penh, University of Tropical Agriculture (UTA, later renamed Center for Livestock and Agriculture Development, CelAgrid), Phnom Penh,

Laos: National University of Laos (NUOL), Vientiane, National Agriculture and Forestry Research Institute (NAFRI), Vientiane,

Thailand: Khon Kaen University (KKU), Khon Kaen, Chiang Mai University (CMU), Chiang Mai, Prince of Songkla University (PSU), Hat Yai, Suranaree University, Nakhon Ratchasima (the latter two not being active at present in the MEKARN network),

Vietnam: University of Agriculture and Forestry (UAF) later Long Nam University, Ho Chi Minh City,

Can Tho University (CTU), Can Tho, An Giang University, An Giang, Hue University of Agriculture and Forestry, (HUAF) Hue, National Institute of Animal Husbandry (NIAH), Hanoi, and

Sweden: Swedish University of Agricultural Sciences (SLU), Uppsala

An interim steering committee was appointed in January 2000 to explore the real possibilities to establish the proposed regional research cooperation. On the basis of preparatory discussions, a stakeholder meeting took place in Ho Chi Minh City in August 2000, agreeing to the following joint proposal.

The participating academic entities would form a network, the Research Cooperation for Livestock Based Sustainable Farming Systems in the Lower Mekong Basin (MEKARN). The network would cooperate by holding annual workshops, at least once per year and rotated among participating countries, submitting candidates to the SLU initiated MSc training programme that would be gradually more and more adapted to, and implemented at, the regional level, and formulating and implementing research projects to be done by participants in the MSc training programme and other researchers at the cooperating institutions, financed from the Research Fund and presented at the MEKARN annual workshops.

Objectives

For the first MEKARN phase 2001–2003, the development objectives were to:

- Contribute to poverty alleviation, and to
- Improve the livelihood of poor farmers.

The immediate objectives were to:

- Strengthen cooperation in research, training, and dissemination of information in the Lower Mekong Basin,
- Exchange ideas, experiences and information
- Promote livestock as the epicentre of sustainable farming systems, and to
- Appoint a steering committee comprised of representatives of the participating institutions and related stakeholders.

For the second MEKARN phase 2004–2007, presently under evaluation, the major change was the integration of the PhD programme component, which had been transferred from the Vietnam-Sweden bilateral research cooperation programme in 2002. Otherwise immediate programme objectives were retained, except the last one, the steering committee having both been appointed and become operational. In addition, capacity objectives were adopted, as well as research objectives.

MEKARN capacity objectives for the current period are to:

- Mobilise a critical mass of researchers committed to sustainable development, with emphasis on integrated agriculture, and to
- Enhance the capacity of junior researchers through short courses, and MSc and PhD training.

Research objectives adopted for this period are to:

- Develop a multitude of sustainable technologies for resource poor farmers in the region,
- Encourage regional cooperation in research,

– Produce training material for the region based on research findings,

– Produce a database on sustainable technologies and produce appropriate information material, and to

– Organise systems for information sharing.

The capacity, research and immediate objectives presented above are those used as reference in the present evaluation.

Organisation

In the MEKARN network, 11 today participating university and research institutions are in a formal sense at par with one another. They can suggest candidates to MSc and PhD training, research projects for funding, and research results to the regional MEKARN workshops. They meet regularly at annual Stakeholder Meetings.

A core group of participating institutions, i.e. the national, regional and international coordinators, also participate in the Steering Committee, which assumes responsibility for current issues, including the approval of MEKARN Annual Workplans. The Steering Committee normally meets three to four times per year.

For the allocation of research grants, a Scientific Research Committee comprising international experts (members: Dr. Ogle, Dr. Preston, Dr. Ledin, Dr. Wanapat, Dr. Leng, and Dr. Rowlinson), meets once a year. The procedure applied excludes that applicants can be involved in the decision of which applications that should be awarded grants.

For coordination at the national level, one institution in each participating country has been nominated national coordinator. They are the RUA, Cambodia, the NAFRI, Laos, the KKU, Thailand, and the NIAH, Vietnam.

Regional coordination is ascertained, as mentioned above, by the Nong Lam University at Thu Duc, Ho Chi Minh City, international coordination being performed by the Swedish University of Agricultural Sciences, SLU, Uppsala.

Phases

As mentioned above, MEKARN builds upon the international MSc livestock production training programme managed by SLU since 1989, and on the previous "Sustainable Livestock Based Farming Systems" component of the bilateral research cooperation between Sweden and Vietnam. Further, the livestock PhD training component of the bilateral was discontinued in 2002, MEKARN taking responsibility for continuing that function. MEKARN is thus at present both a continuation and a combination of several different efforts at enhancing livestock based sustainable farming systems research. The regional parties to the cooperation have expressed a strong desire to see this cooperation also enter into a third phase.

Resources

Sida's contribution to MEKARN during the second phase 2004–2007 totals SEK 32.5 Million. In addition, participating countries and institutions contribute varying sums both in cash and kind. Although these sums have not been accessible to the evaluation team, they should be acknowledged as important contributions to the programme. Budgeted costs to be covered from the Sida grant are, for example for calendar year 2006 [a), b) and c) in USD, d) in SEK]:

a) Networking	
– Annual workshop	30,000
– Short courses (technical workshops and courses)	20,000
– Equipment	10,000
– Connection fees	10,000
– Production of CD-ROMs	5,000
– Advisory and data consultants	30,000
– Travel	35,000
b) Research Fund	**256,000**
c) Training	
– Short courses (English, basic subjects)	15,000
– MSc training	120,000
– PhD training	150,000
Total USD	**749,000**
d) Costs at SLU	
– Minor equipment	140,000
– Consumables	180,000
– Travel	190,600
– Salaries and supervision	1,765,000
– Unforeseen	30,000
– Overheads	427,000
Total SEK	**2,732,600**

3. Main findings

The objectives of the operation were not quantified in the project documentation of December 2003. The evaluation will therefore not be able to submit firm, quantitative assessments.

3.1 Effectiveness

As stated above, the MEKARN *capacity objectives* for the current period are to:

– Mobilise a critical mass of researchers committed to sustainable development, with emphasis on integrated livestock based agriculture, and to

– Enhance the capacity of junior researchers through short courses, and MSc and PhD training.

Three MEKARN MSc courses have been performed (2001–2003, 2003–2005 and the ongoing 2005–2007 course). In 2003, 17 students graduated, the corresponding number in 2005 being 16. The ongoing course has 18 participants. The MSc theses generally have a classical structure with a thesis part, including a literature review and general discussion, followed by manuscripts for 1–3 research papers. Papers from the MSc-theses have to some extent been published in the internet based peer reviewed scientific journal *Livestock Research for Rural Development*. It can be concluded that the MSc-theses generally are of high quality, considering the available experimental resources and the short time available for writing up the theses.

The course programme for the MSc training comprises a 27 weeks block, consisting of 19 courses (in 2001 only 17). The courses are located at different universities or research stations so that all participating countries are represented. The course leaders include lecturers from SLU, Dr Preston, lecturers from Thailand, Australia and Great Britain, and over recent years an increasing number of Vietnamese lecturers and, in the ongoing course also one lecturer from Laos. Beside the MSc courses, three courses in *English*, one on *Statistics and Experimental design*, one on *Research Planning, Experimental design* and *Result Presentation*, and one on *Animal Nutrition and Biochemistry* were organized in the period 2004–2006. In addition, one post graduate course on *Animal Reproduction in the Tropics* and one course on *Advanced Biochemistry and Animal Nutrition*, in which most of the participants were PhD students, have been arranged. Furthermore, one *Goat training course* and one *Round table discussion on buffalo research* have been arranged in the same period. From available documentation, it can be concluded that the courses both on the MSc programme and the other training courses have a relevant content and that the courses are well planned and of a high quality.

During the period 2004–2006, six PhD studies have been completed, the PhD-degree being awarded by SLU. All theses have a classical structure with a thesis-part, being followed by 4–5 research papers. In general, the papers are published in press or submitted to well recognized peer reviewed scientific journals within relevant fields. The theses are generally well written. The quality is high and in parity with the standards prevailing for SLU theses. As can be expected, the PhD-theses demonstrate a higher degree of scientific maturity than the MSc-theses. At present, 11 MEKARN supported PhD students are registered at SLU, their progress being reported as satisfactory.

Many PhD research subjects are further studies of MSc research themes, which, together with the supervision by experienced supervisors and country coordinators, explains why all six PhD students could complete their programmes within a four-year period.

The MSc and PhD-training described has resulted in a number of publications in international peer reviewed scientific journals, and in proceedings from regional seminars and workshops. During the

period 2003–2006, a total of 77 papers were published in international peer reviewed scientific journals (see Annex 5). During the same period, the following workshops were held: *Sustainable Livestock Production on Local Feed Resources* (Hue, Vietnam, 2003, 44 research papers, proceedings available at MEKARN home page); *Workshop on Small Ruminant Production in South East Asia* (Hanoi, Vietnam, 2005, 29 research papers published in 165 pages proceedings); *Livestock Based Sustainable Farming Systems in the Lower Mekong Basin* (Cantho University, Cantho, Vietnam, 2005, 48 research papers published in a 303 pages proceedings) and Forages for *pigs and rabbits* (CelAgrid, Cambodia, 2006, 25 research papers, proceedings available at MEKARN home page).

In conclusion, the effectiveness of the programme in terms of *capacity building* can be considered high.

Research objectives adopted for this period are to:

– Develop a multitude of sustainable technologies for resource poor farmers in the region,

– Encourage regional cooperation in research,

– Produce training material for the region based on research findings,

– Produce a database on sustainable technologies and produce appropriate information material, and to

– Organise systems for information sharing.

The MSc programme, as originally planned, contains 60 credits – seven months of courses, twelve months of fieldwork and experiments, and four months of thesis write-up. By having the courses in different stations within the network institutions, in combination with the research works in the home countries, and the thesis writing work in Ho Chi Minh city, MEKARN aims at providing the students the best conditions for studying and working in both local and regional contexts.

The MSc student research topics, as well as those of previously graduated MEKARN MSc students, generally have a focus on the identification and evaluation of the nutritive value and applicability of new feed resources for animals, and on the development of techniques for improving their nutritive value and their preservation. One study addresses the impact and appropriateness of the developed techniques on farming system as a whole[1]. However, those working on livestock feed evaluation seemed to have better confidence and understanding on what they did, as compared to those who conducted experiments on the linkages between animals with crop and soil, with renewable energy, or survey on livestock within farming systems and agro-ecological systems. This can probably be explained by the content of the MSc courses studied and the research profiles of the supervisors, who have a strong focus on animal sciences.

Furthermore, among 83 publications (during a somewhat longer period than above), eight were on soil-crop-animal-biogas interaction, in comparison to 75 publications on identification and evaluation of new feed resources and development techniques for improving their nutritive value and for preservation. In addition, only three percent of the research fund in 2006 was allocated to the topic of integrating renewable energy with crop and livestock production. This may reflect the so-far rather limited attention of MEKARN research to the livestock and agro-forestry systems, as a part of the broader context of the farming system[2].

[1] One MSc in 2005 by Miech Phalla was about co-generation of energy and feed/food in integrated farming systems for socio-economic and environment benefits.

[2] *A farming system* (FS) is defined by FAO (2001) as a population of individual farm systems, which have similar resource bases, enterprise patterns, household livelihoods and constraints, and for which similar development strategies and interventions. A FS contains of several internal determinants leading to production and consumption decisions, as well as external factors, that influent FS evolution. The external determinants are market, policies, public goods, information and technology.

In summary, the *objective to develop a multitude of sustainable technologies for resource poor farmers in the region* has been achieved in part, which indicates a scope for a broader orientation of research in support of farming systems in the region.

As regards the *objective to encourage regional cooperation in research*, it is clear that the construction and implementation of the MEKARN scheme has contributed to an enhanced regional cooperation. A strong networking activity among universities and research institutions in the region has been established. This can be seen in areas such as the participation in joint regional training courses, the distribution of MEKARN research scholarships and the institutional cooperation in terms of training and approval of MEKARN research grant applications. In all these areas, MEKARN has moved in the direction of the objective set.

Seemingly, this objective is also supported by national aspirations or ambitions both from the side of Thailand and Vietnam, whose governments have declared an interest and have allocated resources of their own for an increased such cooperation, and from the side of Cambodia and Laos, which both have demonstrated an interest in obtaining contributions from their neighbours to an increased institutional research capacity in their countries. This aspect will be further discussed later in this report, please cf. below, Section 4.6.

The amount of *training materials for the region produced, based on research findings*, is limited. It has been reported to the team that in Laos and in Cambodia, research findings have been used for dissemination to farmers in Lao and in Khmer. It seems that only NAFRI within the whole network has produced extension materials in the native language. In addition, CelAgrid has contributed its research results to the work, resulting in the TIPS training material for farmers.

Members of the network mean that more research results should be produced in local languages in order to give higher access of research results to extension system in the region.

Efforts at producing *a database on sustainable technologies and appropriate information material* seem to be limited to the MEKARN homepage, which also addresses the *research objective of organising systems for information sharing*. The team finds that the MEKARN homepage does serve as a database, which can be used to find information material on findings from research and training within the programme. It can be used as a system for information sharing, but it is not clear whether the homepage has been used for producing training material based on the regional research findings.

The MEKARN website is well structured and informative. It contains comprehensive information on MEKARN publications, courses and conferences, as well as the names of graduated and registered MSc and PhD students. This website seems to be a good database for scientific searching and sharing. However, no training material nor extension material for the region based on research findings was found in the website.

3.2 Impact

The ToR for this evaluation mentions three spheres, where an impact of MEKARN operations could be expected. Those are the national research agendas, farming practices, regulations and credit availability for livestock production, and employment.

As regards the impact on the scope and orientation of *national research agendas*, the MEKARN cooperation seems to have had a profound impact on the research agendas of the involved institutions, moving the main orientation from commercial farming systems and practices, which have been found to be unsuitable for the conditions prevailing in the region, towards the problems of smallholder farmers, poverty alleviation and sustainable, environment friendly farming systems integrating livestock, crops, agro-forestry and aquaculture. With the objective of exploring opportunities to use livestock as an

instrument for poverty reduction, the MEKARN research focus is the development of different techniques to improve the nutritional value of both common and new feeds, produced from local resources. The technologies developed seem to be appropriate, with agricultural research priorities for the remote rural areas in the four involved countries. In this region, where large groups of farmers still live under the poverty line, in degraded land prone to erosion, food security and environment protection on the basis of local resources still need to be the focus of research and development agendas.

In addition, in line with globalisation trends in the region, the improvement of market opportunities for the poor is also emphasized in the research agenda of the four countries. For example in Vietnam, the national research agenda focuses on the development of a good market for organic and "green" meat products, as an application of MEKARN developed best practices of low-input and environmentally sound technologies. Improving nutrition and feeding for large ruminants is considered important for livestock production development of poor farmers in Laos and Cambodia, as these countries have a comparative advantage as regards exporting large ruminants to Vietnam and Thailand.

National research budgets have so far been low, but there seems to be a tendency for increased national research funds, and for more competition for getting grants. National funding for laboratory equipment, however, appears to be more extensive, including up to date advanced instrumentation items.

The impact on *farming practices, regulations and credit availability for livestock production* is more difficult to assess at a broader scale. Within the vicinity of cooperating institutions, a close contact is maintained with farmers in the respective areas, research activities being linked to local problems and focusing on increasing the use of available local feed resources in order to reduce production costs, secure feed supply for livestock and improving yield from livestock. In addition, there is an ambition to enhance food security and to produce niche food products with a high quality for which a market can be created or that can be sold locally. The results of research within the programme have been actively accepted by farmers in the region and new technologies have been implemented.

MEKARN impact on farming systems practices is also seen through direct collaboration between researchers from the Ba Vi rabbit and goat station of NIAH with ethnic farmers upland areas in northern Vietnam. It is reported that 70,000 low-cost bio-digestors have been installed for poor rural families in different parts of Vietnam, a remarkable increase from the 10,000 units reported in 2000. In Cambodia, CelAgrid has transferred technologies to farmers in two among the five poorest provinces and in three other provinces through organising Farmer Field School (FFS) and through writing "TIPS of best practices" for the extension services. In Laos, MEKARN is said to affect farmers' practices through producing extension materials in the Lao languages. However, the evaluation team did not see any printed extension materials introducing MEKARN practices during the visit.

The impact of MEKARN at the policy level is harder to judge. The existence of a number of policy makers and leading researchers, who are both involved in MEKARN and engaged at the ministerial level in Vietnam, Laos and Cambodia,[3] should facilitate the transfer of research results to national extension activities in those three countries, and might possibly be used as a policy impact indicator.

In conclusion, the impact for involved institutions and for poor farmers in the region is assessed as high.

MEKARN impact on the *employment of graduated students* can be quantified. Students graduated from the MEKARN MSc programme are now generally in good positions, having returned to their home universities as lecturers, working as research officers, research coordinators or head of research stations,

[3] The present director of the Livestock Production Department of MARD in Vietnam, Dr. Nguyen Dang Vang, used to be the director of NIAH prior to 2005. Dr Hoang Kim Giao, currently the Vice Director of the Livestock Production Department of MARD used to be the vice director of NIAH before 2002. They were both involved in the development of MEKARN activities at NIAH. Dr. Buonthong Buoahom, the coordinator of MEKARN Laos, is currently the Director General of NAFRI. Dr. Khieu Borin – one of the MEKARN Cambodia coordinators, is the director of CelAgrid.

deputy director of a school of agriculture, whereas others have found positions in ministries or are working in the extension service. Research grants have also been provided by MEKARN for PhD-students performing their studies in Vietnam, Japan, the Netherlands and Italy. Among the 33 graduated MSc students, seven students did continue PhD studies at SLU, one each in the UK, USA and Germany. Most of the PhD candidates at SLU are Vietnamese, while most of the graduated MSc students in Laos and Cambodia are currently holding important positions within their government systems and the international programs in the fields of agriculture research, education and development (see Annex 4).

The PhDs trained within the MEKARN programme and graduated from SLU have also been successful in their employment: they have returned to positions as researchers, lecturers, directors of Livestock and Agricultural Development research centres, which have good reputation in their respective country. It appears that the MEKARN supported education has been very attractive for employers.

Furthermore, the cooperation and the training of students by SLU have lead to a change in the way of approaching scientific and technical problems – encouraging critical thinking. Students have stated that this change can be expected to be beneficial for their future activities and can contribute to their continued professional development.

Seen in a gender perspective, the MEKARN programme has been successful – of the MSc students graduated in 2005 and those supposed to graduate in 2007, almost 40% are women. Among the 11 PhD candidates presently registered at SLU, seven are women. Of the six who have defended their PhD:s during the period 2004–2006, two are women. Furthermore, gender issues are addressed in the research themes of the programme, because women often take care of dairy cows, and small animal species such as goats, sheep, pigs and poultry. Women's Union groups have been used for facilitating farm level research and as a tool for the dissemination of results to poor farmers.

The female researchers involved in MEKARN interviewed by the evaluation team showed a clear self-confidence and expressed their gratitude toward MEKARN for the opportunities they had received. It might be noted, however, that so-far, no female researcher participates in the MEKARN Scientific Research Committee or in its Steering Committee.

3.3 Relevance

The livestock based farming systems studied in the MEKARN programme are *mixed livestock based farming systems, rainfed or irrigated*, with a focus on rice-cattle systems (buffaloes for draught and meat), cassava-cattle systems, fruit tree crop-small ruminants, pigs and poultry. In these mixed systems, few purchased inputs are used, manure being important for soil fertility, particularly when land resources are scarce.

MEKARN research focuses mainly on (i) exploiting local comparative advantages in order to produce biomass for food, feed and fuel for local consumption, and less on (ii) recycling waste from livestock production to avoid pollution and produce renewable energy. The two themes are highly relevant to the mixed systems mentioned. So-far, less research has been done on (iii) the sustainability of the selected systems in terms of economical, ecological and sociological aspects, and (iv) how the integrated system developed by MEKARN can provide food security to reduce poverty, and products for sale on national and world markets, themes that were emphasized as research strategies in the MEKARN proposal for phase II.

In practice, training programmes and research themes are focused on sustainable, environment friendly farming systems integrating livestock, crops, agro-forestry and aquaculture, and the activities have a strong focus towards poverty alleviation. Their combined objectives are to decrease production costs

and increase productivity in the farming systems by use of locally available feed resources, and to utilize renewable energy sources.

Five thematic sub-networks have been established within the programme: scavenging poultry, buffaloes in integrated farming systems, tree foliage for goats, forage for pigs and low cost bio-digestor technology. All these themes directly focus on improving livelihood of smallholder farmers and poverty alleviation.

The focus on scavenging poultry is highly relevant, because scavenging poultry has been estimated to make up 70 – 75% of the chicken population in Vietnam, and probably similar fractions in the other countries within the network, poultry being an important source of nutrients and income in the rural households. The sub-network "Buffaloes in integrated farming systems", coordinated from Can Tho University in Vietnam, owing to the importance of buffaloes mainly as draft animals in the region, also has a focus of relevance for the programme.

Tree foliage for goats, the focus of the third sub-network in the programme, has made it possible to increase goat productivity. The collective outcome of sub-network activities has lead to an increased use of tree foliage in goat (and sheep) production, hence an increased utilisation of a cheap, abundantly available food resource with good nutritional properties, contributing to increase smallholder incomes from goat production. This focus area is of high relevance for the programme.

Similarly, the fourth sub-network aims at increasing the use of cheap, locally available food items, but for pigs. Activities have, in addition to evaluating the nutritive value of different feedstuffs focused on methods to preserve feedstuffs and to increase the inclusion level by detoxifying cassava. Simple techniques for ensiling forages have been developed. The program component on forage for pigs can be considered as highly relevant.

The fifth sub-network area is low cost bio-digestor technology. This technology, an important part of the integrated farming system approach, utilises manure from the livestock and other organic waste products to produce methane for cooking, and for producing electricity. The effluent can be used as crop fertilizer, or as fertilizer for fish ponds. This part of the programme has a high relevance both from an environment preservation point of view and in a poverty alleviation perspective.

The programme contains several other elements which are of high relevance in a regional perspective, and in a poverty alleviation perspective, such as fish nutrition and production, an increased use of locally available forages for rabbits, and earthworms and earthworm compost by using animal manure.

In conclusion, the relevance of this research and training programme is high in the perspectives of environment, food safety and poverty alleviation, particularly as regards a more efficient use of locally available feed resources. The programme is also in close concert with the CGIAR System Priorities 2005–2015, priority areas 3–5: *Reducing rural poverty through agricultural diversification and emerging opportunities for high-value commodities and products (3); Promoting poverty alleviation and sustainable management of water, land and forest resources (4); Improving policies and facilitating institutional innovation to support sustainable reduction of poverty and hunger (5).*

3.4 Sustainability

MEKARN capacity building has produced a number of MSc:s and PhD:s, who are now capable of a considerable impact of their own on research and teaching activities, contacts with extension services and dissemination of results to farmers as well as contact with governmental and private funding bodies. Furthermore, in regions where the results of the research have been implemented in practice, good results among farmers adopting the results and techniques are presumed to be spread to other farmers. This is in effect sustainable programme results.

However, there are some concerns: the programme itself will only remain sustainable if staff trained within the programme continues to hold key positions in relation to the main programme objectives also after a termination of the foreign support (a case in point being the MSc Agric, who is working as the driver of the Swedish Embassy in Phnom Penh because of the low salary level in the government administration). Another concern may be that the extension service so far seems to be too little involved in the dissemination of results to farmers, and that therefore too much responsibility for a sustained success in the strive for poverty alleviation is placed on very few persons.

The coordination of activities has been shifted more to the region during the second phase of MEKARN. Research facilities, including field and laboratory equipment, have been improved. Some graduated PhD:s from the SAREC/SLU bilateral programme and MEKARN first phase are providing local guidance and supervision to MSc students in Vietnam and Cambodia. Thailand partners[4] provide courses to regional MSc program, and supervision to Laos and Thai MSc students. Key lecturers and researchers from the MEKARN network institutions give lectures to the regional MSc program. However, the roles of SLU and international experts and supervisors remain important, as they contribute to bringing the research quality of the network to an international standard.

The sustainability of programme results is, in summary, above average. It is, and will continue to be, subject to changing parameters outside the control of programme partners.

3.5 Efficiency

Of total MEKARN 2004–2007 resources of USD 2,983,200 (approximately SEK 21 Million) and SEK 11,260,250 (approximately USD 1.6 Million), respectively, direct training costs amount to 1.3 Million or 28%, the research fund and networking each taking 832,000 and 560,000, or 18% and 12%, respectively. Including an overhead of 10%, the regional part of the budget thus amounts to around 65% of the overall programme resources. The remaining 35% stays with SLU, to be used for minor equipment, consumables, travel, salaries/supervision, unforeseen and for the university overhead of 20.48%.

Of an average annual SLU total cost of SEK 2.767 Million, 1.650 are allocated for PhD supervisor fees, 605,000 for salaries for two persons in connection with, inter alia, the supervision of MSc student research projects and the preparation of MSc theses, 195,000 for related travel, and 140,000 and 177,000, respectively, for minor equipment, consumables, other travel, etc for the PhD studens. In total, the annual sum per PhD student approaches SEK 200,000. Finding this sum on the high side, the team has attempted to compare this cost item with some similar activity, but has not managed to find a relevant one. The team assumes that Sida has had the opportunity to negotiate cost components so as to achieve competitive and mutually satisfactory levels and terms, and an appropriate financial structure for the project.

It is difficult to judge the operational efficiency of SLU, for example comparing the number of PhD:s produced, or the productivity of SLU advisory staff, with other academic institutions, as context, quality and other specific factors influence performance and results. As reported above, six PhD studies have been completed so-far during the period 2004–2006, another 11 PhD students progressing satisfactorily at SLU at present. Assuming that study time and costs are approximately equal between the two MEKARN programme phases, and as a larger number is under study at present compared to phase 1, it can be concluded that approximately nine PhDs will have been produced during phase 2. The production of PhD:s consumes an additional total USD 600,000 from the training budget. On the other hand, PhD supervision costs are not specified in the budget or in the annual progress reports. It is therefore not possible to establish an average unit cost per MEKARN PhD.

[4] Chiangmai university and Khon Kaen university.

As SLU costs evidently are higher per allocated work hour or almost any other unit chosen than those of regional staff, plus travel costs, the evaluation team has repeatedly checked whether there would not be a preference at the regional or local level for relocating more of operational responsibilities and related resources from Sweden to the region. But the persistent answer has been negative. The higher cost level notwithstanding, something that is quite clear to all concerned, there is an expressed wish amongst programme partners in the region to retain the present arrangement unchanged. The team takes this as an expression of satisfaction that, lacking more quantitative measures of efficiency, can be perceived as a token of efficiency as regards the contribution of SLU.

Budgeted networking costs amount to a total of USD 560,000 for the four year period. Main components are an annual workshop, short courses, equipment, connection fees and advisory and data consultants. To the evaluation team, the amounts allocated seem reasonable for the planned output. In particular, MEKARN seems to have ascertained the participation of internationally renowned expertise in the operation at a modest cost, in view of the level of competence.

The Research Fund takes an allocated USD 832,000 during 2004–2007. The team has learned how research grants are allocated and how research results are being disseminated in specialised journals. All this seems satisfactory. There seems to be some scope for increasing efficiency here, though, namely by enhancing the dissemination of research results at the national level, through national extension service networks, through farmers' or women's unions, or other channels as appropriate, please cf. below, Section 4.2.

Arrangements for training, i.e. short courses, MSc and PhD training, seem convincing to the evaluation team. PhD costs have been calculated on the basis of a standard cost of USD 15,000 per student and year for local research, travel, and living costs in Uppsala for ten students. MSc costs for 16 students during 30 weeks cover travel, course fees, food and accommodation, international facilitators and local supervisors. The evaluation team finds the cost level for the three components acceptable.

In summary, the evaluation team has no observations to the efficiency level displayed by the MEKARN programme.

4. Evaluative Conclusions

4.1 In the Forefront of Research

According to the ToR, the scope of the present evaluation is to situate the regional programme approach within the global context and debate on livestock based sustainable farming systems research, as a means to reduce poverty, both in a rural and an urban setting.

One of Sida's concerns is the level of the programme in relation to the forefront of science, measured as number of publications in international and regional scientific journals, publication strategies in terms of scientific publications, policy briefs, booklets, etc, and its contribution to the international research dialogue. The PhD training provided by SLU has resulted in PhD projects within subjects of high relevance for the main objectives of the MEKARN cooperation, and within aspects of animal nutrition and production that are urgently needed in order to evaluate the optimal use of local feed resources in the region, and for the optimal utilisation of indigenous animal breeds. To some extent, the projects are multi-disciplinary. The studies are based on classical, well documented methods, supplemented with the necessary laboratory analyses, and have given reproducible, well analysed and interpreted results. The physical conditions under which the experiments are performed are simple compared with Western standards, but still allow for performing well designed balanced experiments with a sufficient number of replicates.

This type of studies cannot, and should not, be in the absolute forefront of research. On the other hand, they are of high quality and high relevance and have a doubtless value. This is demonstrated by papers from the PhD-theses being published in well-recognised international scientific journals with 2005 impact factors ranging from 0.376 (Journal of Sustainable Agriculture; ranked as the 17th most cited out of 31 in the category Agriculture, multidisciplinary) to 1.241 (Field crops research; ranked as the 13th most cited out of 48 in the category Agronomy, please see Annex 6). Among 83 publications produced during the two phases of the project, 2002–2006, 58 were published in the computerized journal "Livestock Research for Rural Development" and 25 in international journals, which mainly focus on animal sciences.

With 11 PhD candidates conducting their PhD programs at SLU at present, it is expected that another 30–40 articles will be published in international journals. The total number of peer-reviewed publications can amount to about 65 by the end of the second phase of the project. Furthermore, 18 MSc theses ready by 2007, together with several scientific articles produced as a result of the 43 projects funded by the research fund in 2006, will be published in "Livestock Research for Rural Development". The team expects the total number of international publications of the second phase to meet planned results (100–150 international publications), as stated in the research proposal for the second phase of MEKARN.

In a global perspective, the regional research programme of MEKARN is well in line with the CGIAR Millennium Development Goals, especially with respect to its focus on reducing poverty, improving food security, and improving the sustainability of resources and biodiversity and increasing income from livestock. The focus on the use of local breeds is also important for conserving valuable genetic recourses. The MEKARN cooperation also includes approaches to increase livestock based incomes by crossbreeding of indigenous breeds with other breeds with suitable genetic properties. In addition, the CGIAR intentions to help smallholder farmers to diversify into higher value products, and creating markets for this type of products are addressed within the MEKARN programme, for example through the BAVI Rabbit and Goat Research Station, where a system for the collection of milk from farmers and for producing yoghurt and cheese has been developed, products that are sold at good prices in Hanoi.

Thus, while clearly not being in the research forefront as regards basic research and the use of the most modern experimental techniques, MEKARN seems to be well in the forefront of research as regards developing and adapting methods, techniques and other means of production of relevance for poor farming systems in the region.

Some considerations regarding how to develop the research programmes in the region for future progress can be made here. Whereas the status of some studies today is more of an inventory and descriptive character, future studies ought also to focus more on metabolic effects and physiological explanations to findings. A more detailed determination of the nutrient and energy values of local feedstuffs evaluated in digestibility, balance and production experiments could be made by combining these data with data from respiration experiments (unit available at NIAH, Hanoi). In such an effort, a more sophisticated characterisation of dietary ingredients (i.e. more extensive use of amino acid analyses, more detailed fractionation of the carbohydrate group into its different components, fatty acid analyses with special reference to essential properties, mineral compounds and vitamins, toxic compounds) would be a part. Furthermore, blood profiles of hormones and metabolites could be more extensively used as explanatory factors, and changes in gene expression for e.g. some mRNA and proteins in response to different feeding strategies could be tools to be developed in the future. Laboratories in Vietnam seem to have most of the laboratory equipment for these assays available. These types of studies could preferably be performed as collaboration projects between groups in the region, also in order to make advanced laboratory facilities available for researchers in less well equipped locations.

Moreover, with reference to the objective of increasing food safety, some future studies could preferably focus on toxins and contaminants in the food chain. Such an initiative has now been taken with the start of a PhD project on the evaluation of mycotoxin contaminants in Vietnam. Another ongoing PhD project focuses on food safety.

The team also finds that research on poultry ought, despite – or possibly even because of – the danger of bird influenza, to be enhanced and restarted at additional places. Aspects on how to protect birds from bird influenza outbreaks ought to be given increased priority.

Research on fish nutrition and integrative systems with livestock, bio-digestors, fish and vegetable production would also be important aspects to address at a broader scale.

4.2 Poverty Relevance

The long-term objectives of the MEKARN programme are to increase the productivity and efficiency of livestock production within the context of sustainable integrated farming systems that make optimum use of locally available resources. The team notes that, in a poverty perspective, MEKARN programme activities seem to have affected regional farming practices to a considerable extent, when results from the project have been implemented among farmers. Farmers are often recruited to participate in the programme on a community or village basis, which allows ideas and technology to be spread in the region. Farm visits by the team showed, for instance, how the cut and carry system was implemented for confined dairy goats and yellow cattle, how goat keeping was integrated with earthworm production and integration of rabbit and dairy goat production, and in all cases integration with bio-digestor technology. Farmer wealth was claimed to have been significantly improved. Furthermore, with the market-oriented changes under way in the region, the improvement of market access for livestock products has been addressed in national, regional and global policies and development.

On the other hand, the team remains to be convinced about the sub- and consequent dissemination of results to poor farming households on a broader scale at the national level. In principle, this should be ascertained by national extension services but in some countries at present, these services are said to

tend to give priority to more clearly market oriented agricultural investment and development. Consequently, and so-far, MEKARN is relying on alternative channels for dissemination, such as Farmers' Associations and Women's Unions. This may well be the most rational option in some cases but at least in Lao PDR, the team has the impression that there is scope for an intensified dialogue with national extension services. It would also seem logic, in view of national policies on poverty eradication in the MEKARN countries, to maintain a continued effort at dialogue with extension services also in the other countries.

Further, the team finds it difficult to quantify MEKARN impact on poverty relevant national policies and debate in livestock production, as well as on regulation, credit facilities, subsidies and other factors affecting livestock production in the region. Efforts have been made, as mentioned above, especially in Laos, to translate research publications into Lao in order to disseminate the results to extension workers for further dissemination among farmers. A similar approach has been used in Cambodia where for example the MEKARN partner organisation CelAgrid supports the national extension service in developing the "TIPS" (technology implementation procedures for farmers). However, the team has the impression that so-far, the impact at the national systems level is marginal.

The MEKARN type, livestock based farming systems have an objective to diminish environmental degradation, and still increase animal productivity and economic performance. Thanks to the large capacity for vegetative growth in the region, many crops can supply sufficient animal feed also when only a small land area is available. With the help of bio-digestors, manure is converted from a potential environmental pollutant to a valuable supply of gas. Using the effluent as an organic fertilizer allows inorganic commercial fertilizers to be avoided. The system has advantages from a poverty alleviation point of view, as it produces a positive influence on animal production performance, thus creating more income to the households, while environmental pollution created by high animal stocking density might be avoided. A possible weak point may be that even the cheaper types of bio-digestors used in the region may be too expensive for the poorest farmers.

With respect to the influence of livestock based farming systems on poverty issues, gender aspects are essential. Women are usually responsible for taking care of small animal species (small ruminants, pigs and poultry) and often also dairy cows, whereas men take care of buffaloes and field work. Therefore, women are key persons for the dissemination of new systems to farmers. They are also those who may benefit most from the improvements that can be gained. This women's key role has a clear relation to MEKARN activities. It also seems clear that starting activities via Women's Unions has been an efficient move, and that participating women have benefited. A possible concern may be that the cut and carry system is a labour intensive technique, where much time has to be spent on collecting, transporting and cutting forage, which may thus consume a considerable part of a woman's day if she is alone responsible for several animals.

4.3 Programme Rationale

The evaluation has been asked to assess to what extent the programme has been able to link national research in the region with the regional and global debate and research agenda. The ToR refers to the Consultative Group on International Agriculture Research (CGIAR) system, which has identified a number of priorities where livestock is identified as a strategic issue for reducing rural poverty through agricultural diversification and emerging opportunities.

The evaluation team has learnt that MEKARN research activities in Vietnam and Cambodia are known to and considered suitable to small holders by the International Livestock Research Institute (ILRI). Further, the MEKARN research programme in Laos is linked to the on-going forage programme led by the International Centre for Tropical Agriculture (CIAT) regional programme.

Linking MEKARN research regionally and globally includes the publication of research papers from MSc theses mainly in an internet based peer reviewed scientific journal, and publishing papers from PhD theses, all as described above. Progress reports and short research papers have been published in proceedings from workshops and international conferences. Efforts at national level dissemination have also been mentioned above. In combination, the MEKARN publishing policy seems to give a good balance between progress reports, rapid spreading of scientific results by easily accessible online publishing, the slower but necessary publication in conventional scientific journals, and publications for laymen.

It has been suggested by Dr Bounthong Bouahom, the Lao MEKARN national coordinator, that a synthesis be made of MEKARN developed knowledge and technologies, in order to allow a comparison with the regional and global debate and research agenda. Gaps could be identified to form new directions. The team finds this suggestion interesting, and means that research findings might be used to develop policy briefs, booklets, etc. to be delivered to a wider society in the region. In line with the MEKARN plan of activities proposal for Phase II, databases and teaching materials should also be produced on the basis of the publications. As only little database and teaching material has been seen, such work should be initiated soon. The team, however, does not see that MEKARN at present has all the resources needed for this task and therefore suggests that efforts are dedicated to working out appropriate solutions to this issue during the last project year 2007.

MEKARN activities are linked to various globally discussed priorities for the development of sustainable livestock based farming systems, for example:

– Linking livestock based farming system small holders with the market through promoting rare high-value species or traits, or "green products" of organic farming. The current package of "green" animal feed developed by MEKARN is in line with this direction.

– Sustainable management of crop genetic resources and biodiversity, and enhancing the access of poor farmers to diverse crop genetic resources. One example is the programme for bio-safety. Crop-livestock systems in the lower Mekong region will benefit from genetically modified plant varieties for insect resistance or herbicide tolerance. This "high-tech" topic might also be suitable for PhD training of livestock based farming systems experts.

– Gender empowerment opportunities and constraints through livestock based farming links in with internationally reported findings that work with smaller livestock particularly benefits the incomes of women and the nutrition and education of girls.

– The diverse use of crops and crop residues for energy, food and feed, propagated by MEKARN, links well into the current research agenda. In recent years, the changing world energy situation has generated an intensive discussion about bio-fuels, much of it promising a source of environment-friendly energy that would also be a boon to the world's farmers.

– Better infrastructure and better market access provide new perspectives on food security. Food insecurity is a result not simply of a lack of food availability, but also of poverty. If increased production of bio-fuels can raise the incomes of small farmers and rural labourers in developing countries, it may improve food security.

Such strategies require close collaboration between livestock scientists, agronomists and crop breeders. To improve interdisciplinary cooperation and networking for research concerning livestock based farming systems, closer links between MEKARN researchers and researchers from other disciplines such as agronomy, environment and rural development need to be established. Furthermore, links between MEKARN and the most relevant CGIAR:s such as ILRI, IFPRI, and ICRAF, might well contribute to raising the profile of the MEKARN network.

For example, the Vietnamese policy for agricultural development 2003–2010 stimulates smallholder participation in livestock markets. With the same market-oriented strategies, Laos and Cambodia consider large ruminants development as a comparative advantage vis-à-vis Vietnam and Thailand. At a regional level, ILRI's strategic plan (MTP 2005–2007) has adopted a sustainable livelihoods framework with livestock for the poor, improving the productivity of their livestock systems and their market opportunities. At a global level, the key for policy, as stated in the 2020 vision by IFPRI, is to ensure that "meat, milk, and eggs are available to the poor, who are likely to derive the greatest health benefits, and that livestock production is organized to bring the greatest benefits to the poor and to minimize damage to the environment".

Sida has been financing research cooperation bilaterally in adjacent thematic areas during the same period in two of the four MEKARN countries, namely Vietnam and Laos. The ToR asks whether there has been any synergies from the two modes of cooperation, and, if not, whether there should there have been.

To the evaluation team, the issue of synergies between bilateral and regional programmes belongs to the discussion about the programme rationale. As for Vietnam, the bilateral programme is being phased out at present. This program has been evaluated and reported in Nørlund, 2005[5], and is being reviewed in parallel to the present evaluation. The view of the Vietnamese Ministry responsible for international research cooperation (Ministry of Science and Technology, MoST) is that there is a synergy between the two programmes. The PhD training in livestock production that was previously part of the bilateral programme integrated farming systems research, was shifted to MEKARN in 2002. MoST expresses its satisfaction with the outcome so-far – 15 PhD:s, 33 MSc:s, five laboratories established and several interesting research projects running. In addition, MoST expresses the view that broadening bilateral research cooperation onto a regional level might be interesting also in other fields, please cf. below, Section 4.6.

Furthermore, SLU is the international coordinator for a component of the bilateral programme (Rural Development and Environment) and MEKARN. So-far, only limited synergies between MEKARN and this program have been found. Possible links between MEKARN and RDViet are discussed in Section 4.8, below.

In the Lao PDR, on the other hand, there seems to be no synergies between MEKARN and the bilateral Sida financed research cooperation programme, although one MEKARN advisor participated as a lecturer in a bilateral programme course. Interesting links, for example regarding the role of livestock in forestry development, could be more actively researched upon.

4.4 Capacity Building

The team has applied four different perspectives on the issue of capacity building – individual, institutional, national and regional.

At an individual level, MEKARN capacity building has been successful. The MSc:s and PhD:s graduated have in most cases returned to good positions after their training, also having shown an ability to manage advanced and complex tasks. Most of them are now considered important resource persons in their respective countries and positions.

Institutional capacity building is a complex and long term undertaking. MEKARN has contributed and is contributing in terms of both individual training and other items, such as equipment needed for research. There is evidently still a considerable lack of capacity in some of the universities and research

[5] Nørlund, I., 2005. Funding mechanisms for strategic research on sustainable rural development and poverty reduction in Vietnam – Background and outline of two Sida-supported funds.

institutes in the region, particularly in Laos and in Cambodia. For these to have a positive development comparable with the more advanced universities in the network, it is necessary that the capacity building contributions that MEKARN has provided can be continued. The team sees a continued MSc-programme as a prerequisite for long term sustainable success. It would also seem that the issue of institutional capacity building would merit a more comprehensive and even aggressive approach in the planning of a next phase of cooperation. The team sees the MEKARN approach as a valuable alternative to bilateral programmes as concerns specific capacity building efforts, displaying advantages over the bilateral option as regards, for example, the choice of cost-effective solutions and the regional integration effect that comes as a result of the work itself.

At the national level, the team has observed considerable discrepancies between universities in Thailand and Vietnam, for example in number of staff with higher education. Whereas participating universities in Thailand seem to have a high level, the situation in Vietnam varies, several universities now being able to perform their own capacity building, while others are in great need of increasing their number of staff with MSc or PhD degrees. As for Laos and Cambodia, the lack of staff with higher education at large is hampering the possibilities for a rapid development. The regional division of participation shows presently six Vietnamese, five Lao, four Cambodian and three Thai students participating in the MEKARN MSc training. Amongst the PhD-students presently registered at SLU, eight are Vietnamese, while only two come from Laos and one from Cambodia. Considering the development level of the research capacity of the respective countries and the respective need for training, the share of participation from Laos and Cambodia at both MSc and PhD levels should be raised in an eventual programme extension after 2007.

It is clear to the team that the regional cooperation has been and is an important capacity building factor because of the contributions from regional lecturers and assistants to the MSc-training, and because of the exchange between different countries that the students experience during their studies. The building of the network with Nong Lam University in Ho Chi Minh City as coordinator seems to have been an efficient way of organising the cooperation, something that is acknowledged by the team.

The research fund linked to the MEKARN programme has awarded research grants of USD 112,600 for 50 projects during 2004, 139,000 for 42 projects in 2005, and 224,000 for 60 projects in 2006, which means that an average of USD 3,280 are awarded per grant. The projects awarded grants are selected by the Scientific Research Committee among applications from researchers in the region. Results from the latest awarding of grants demonstrate a dominance of Vietnamese universities as well as regional differences in Vietnam in sums awarded, differences that reflect both differences in number of applications from the different universities and differences in research capacity between universities in the region. Considering that the average sum awarded per grant is relatively small it could be considered, also as a tool to strengthen the regional cooperation, to encourage cooperation between research groups from different institutions to make joint applications for larger projects. By such an approach, also the mobility in the region could be further improved.

4.5 Gender Aspects

The influence of livestock based farming systems on the gender aspects of poverty has been mentioned above, Section 4.2 on Poverty. The responsibility of women for the care of small animal species makes them key to the dissemination of new systems to farmers, beside the fact that they also may benefit most from the improvements to be gained. Against this background, MEKARN research activities have a high relevance for urgent development needs.

In a gender perspective, the MEKARN training and research programme seems well justified. The percentage of females trained is high (see 3.2), and even dominating among the present PhD-students, and will thus be able to contribute to correcting present imbalances. The women, who have

already graduated from the programme, have proven to be confident and strong individuals who might become both influential in their respective work conditions and role models for young students and researchers.

As regards female MSc:s and PhD:s trained by the MEKARN programme in the role as advisors for the farmers, it seems that they were well accepted and liked. This can be explained by the fact that, as mentioned above, women are usually responsible for taking care of small animal species, like small ruminants, pigs and poultry. Since MEKARN research concerns small animal species, and also since women's associations act as research partners, female researchers are easier accepted and liked, and hence contribute more effectively to the results dissemination process.

4.6 Regional vs. Bilateral Cooperation

The ToR asks whether there is a regional justification, and on what grounds. And, if so, how this is articulated in national strategies and policies.

From a livestock based farming systems point of view, regional cooperation appears well justified. The countries participating in the cooperation have several similarities that motivate regional cooperation. They also share constraints and needs, for example resulting in intensive interaction between the countries in animal production and export of cattle from Cambodia and Laos to Vietnam.

Joint and parallel research can thus be of benefit to all partners. The regional approach applied in the case of MEKARN has resulted in effects and impact as reported above. It seems clear to the team that the regional approach in this case offers advantages that are not available to bilateral Sida programmes. It could even be considered to shift components from bilateral frameworks to the regional one, as has been done in the case of livestock PhD training in Vietnam, and also to give the regional programme a more clear function as regards capacity building in cooperating countries with a presently low research capacity.

As stated above, the team cannot report on any specific articulation of MEKARN effects and impact in national strategies and policies. However, the option referred to below would seem to confirm that priority is given to regional cooperation at the national policy level.

The present case also offers interesting possibilities at considering joining Sida resources with Thai and Vietnamese government resources, available for academic cooperation in various forms. Both countries have budget allocations for academic exchange with Laos and Cambodia, i.e. for teaching abroad and for receiving students at home. From the point of view of Laos and Cambodia, Thailand and Vietnam offer relevant training facilities and conditions close to home. And evidently, the cost picture is different from that of Sweden. The team has understood that all four sides would, in principle, be interested in discussing some type of arrangement, where regionally available resources are combined with a continued Sida support in such a regionally strengthened scheme. The aim should be an expanded cooperation, to the benefit of all four countries, not least Cambodia and Laos, where regional partners take an increased share of responsibilities, including cost-sharing.

Incidentally, the team feels that the regional perspective, involving the four Lower Mekong countries, might also be relevant in other fields of research cooperation, in agricultural development as well as in other fields. One case in point could be the field of health research, where regional endemic patterns seem to motivate joint research efforts, and where a broad cooperative arrangement involving researchers from and in the region together with a lead institution in Sweden could be worth while considering.

4.7 International Expertise

As reported above, MEKARN traces its origins back to the SLU MSc training programme of 1989, which was run in its totality by SLU. Partly with the help of staff trained in that programme, national staff has been able over time to assume more responsibility in programme implementation. So-far, the MEKARN programme has involved both international and regional expertise in training programmes and research cooperation, but the contributions from regional teachers and researchers have increased over the years.

The initial total reliance of this training programme on international lecturers (Dr. Reginald Preston, Dr. Brian Ogle, Dr. Inger Ledin and others) has thus given way to an increasing participation of lecturers from Vietnam and Thailand. Now also one lecturer from Laos participates, contributing to a decreased dependence on Western participation. Also among laboratory assistants, the participation from the region has changed from being solely Vietnamese to being almost equally distributed between Vietnam, Laos and Cambodia. The team feels convinced that this trend can continue in the near future. It might preferably be formulated as a goal, further to increase the contribution of lecturers and laboratory assistants from the region.

However, completely to abandon the support from international expertise would probably have negative effects in the long run, because there are still relatively few highly qualified scientists among the staff available in the region. The international contribution can also be seen as a way of widening horizons, similar to the common practice of involving international lecturers in PhD courses in Scandinavia. One suggestion could be that the international support in the future is more allocated to, and focused on, giving advanced courses for PhD-students and for post-docs, less of their time being allocated to the MSc-classes. Thereby, a continuous development of the skills of post-doc researchers in the region could be encouraged. The strong support to the MSc training and research programme given by Dr. Reginald Preston has been invaluable both from the view of his outstanding overview and experience in livestock based integrated farming systems, and from his personal support to the students and young researchers. If he is willing and able to continue in the programme, it would be most valuable.

4.8 The Role of SLU

A key issue highlighted in the ToR is the phasing out of SLU's role as regards coordinating the MSc training and awarding the MSc-degree.

As has been reported above, SLU has been successful in supporting and developing research activities in the region in close concert with the global debate and research agenda. The programme has been developed well in agreement with regional needs. There is general consensus that the contribution from SLU has been a prerequisite for training staff to confident, independent researchers who, in the case of PhD:s, now are ready for taking responsibilities at higher levels. The fact that there is a good harmonisation of training between different countries will also make it possible in the future to make more integrated research efforts, where facilities in well equipped laboratories at the best established universities can be utilised also by researchers working at less well equipped locations. Still, all universities in the region are rather to be considered as teaching than research universities, but increased competition for financial resources together with growing government support for laboratory equipment, might change this in the future.

Before the current phase of the programme was initiated, one concern raised by Sida was the issue of phasing out the SLU MSc degree and the SLU coordination of the MSc training. As reported above, this training programme initially relied entirely on international lecturers, but has seen the participation of regional lecturers increase over the years. Also the contents of the MSc training has gradually been changed and adapted to local requirements.

The current regional MEKARN MSc programme is characterized by international teaching methods, a multidisciplinary and systemic content, and independent research works by the students, each closely linking with the MEKARN framework. The MSc degree awarded has allowed students to continue to the PhD level, both at SLU and at other universities in the United Kingdom, in the US and in Germany. The quality of the MSc degree is also confirmed by the important positions within national and international organisations that the networking institution members have taken after their graduation (see Annex 4).

Based on development, it has been suggested that the Nong Lam University in Ho Chi Minh City could take over the responsibility for the MEKARN MSc training and for awarding the degree. However, during the course of the evaluation, the team has received no acceptance of this proposal. In particular, it is maintained that an MSc degree awarded by SLU has a more competitive value than a Vietnamese or regional degree for students applying for PhD-scholarships in foreign universities, thus opening opportunities for the networking institution members both for further PhD studies in Sweden and other western countries and for obtaining better working opportunities. Another merit of awarding the degree from SLU, mentioned by stakeholders, is that SLU is as a university entering the Bologna process. Thereby a degree from SLU should be comparable to a similar degree from any EU university within the Bologna system, a considerable advantage for candidates competing for international scholarships. In addition, although Nong Lam University in Ho Chi Minh City, as coordinator of the MEKARN actions, probably would be able to award the MSc degree, one constraint with Nong Lam as a degree awarding university could be that students would be requested to take in courses in Marxism-Leninism.

The team finds that the MEKARN MSc degree should continue to be awarded by SLU.

It might be considered to open some MSc courses, particularly in farming systems, soil-crop-animal interaction, agro-forestry systems, renewable energy, and research methods, also to MSc students from other relevant disciplines. Such courses could be co-organized with the SLU Rural Development and Environment (RDViet) MSc degree program, funded under the Sida/SAREC bilateral programme in Vietnam. The MEKARN network institutions in Laos and Cambodia can also benefit from this opportunity, if the RDViet network is made into a regional network. A coordination of the two networks can be facilitated by the fact that the national coordinator of the RDViet network at the Hue University of Agriculture and Forestry also has his PhD degree from the SLU Livestock based Farming System programme and is currently an active researcher within the MEKARN network.

As regards the PhD-training, the sandwich model with SLU as supervising institution and main research activities being carried out in respective home countries, has been shown to work well. Students have been able to carry out research relevant for their regional problems and under relevant environmental conditions, following PhD courses, working on data analyses and writing up papers and theses in Sweden. During their periods in Sweden, they have had continuous support from qualified and dedicated supervisors, who have been able to support their students to produce PhD-theses of high standard. The SLU standard of PhD theses, where two papers must be published or accepted before the thesis can be defended, is probably the highest among agricultural universities in Scandinavia. The role of SLU and its supervisors is therefore crucial for maintaining this high level of the PhD theses. New names are appearing among the supervisors for the students presently registered at SLU, something that the team sees as positive and showing that SLU and its staff are willing to increase their input into the project.

The MEKARN commitment of SLU has three main components – MSc teaching and degree, PhD teaching and degree, and general programme support and coordination. The third function, as the international MEKARN coordinator, comprises several different parts, such as participation in the MEKARN Steering Committee and in the Scientific Research Committee, counselling and supporting various actors and current activities, and reporting to Sida on overall programme implementation. The team has found that SLU has been performing these functions to full satisfaction. The suggestion to terminate SLU's fulfilment of this function has not found support during the present evaluation, the coordination by SLU being seen as a guarantee that high quality training is maintained. Further, should Sida wish to invite the programme partners to proceed with planning an expanded and regionally strengthened third MEKARN programme phase as suggested by the team, SLU would continue to be a valuable partner in cooperation.

4.9 Funding Issues

The universities and organisations participating in the MEKARN cooperation have so far reported that governmental funding for research is sparse. In Vietnam, HCM City Nong Lam, Hue and NIAH have now been provided government funding for advanced laboratory equipment. However, universities compete for government funding and a considerable difference prevails between different universities and research institutes in their success in finding external financial support. Thus, Vietnamese universities also depend on provincial government funding, whereas CelAgrid in Cambodia has secured funding from a variety of sources, such as the CIDA Fund for Food Security Initiative, Heifer Project International, Cambodian Agricultural Research Fund, DURAS Ministry of Foreign Affairs France, International Foundation of Science, FAO, and CIAT. Also in Laos, government funding was supplemented by funding received from CIAT and FAO. Although is seems possible that government funding and funding from other sources may increase in the future, especially in Vietnam, it is not likely that funding to such an extent as to keep the present level of activity up will be received in a foreseeable future.

Further, in view of the different conditions in the countries participating in the MEKARN network, there is a particular need for financing operations in the countries with the poorest conditions.

As will be stated below in Section 6, the evaluation team recommends that MEKARN cooperation be extended into a third phase, expanded and further integrated regionally. Should Sida and the MEKARN partners choose to proceed in this direction, continued and possibly increased Sida financing will be required.

5. Lessons Learnt

In summary, and according to the evaluation team's consolidated impression, the MEKARN cooperation is a well managed programme with a high level of effectiveness, relevance and impact. As regards efficiency, the team has limited grounds for a full assessment, but has no observations to the present arrangement. The sustainability of programme results is, in summary, above average.

One important lesson learnt concerns the programme rationale. MEKARN research and training activities are highly relevant for the region and have a focus on smallholder farmers and on tools for poverty alleviation. MEKARN is clearly not in the research forefront as regards basic research and the use of the most modern experimental techniques. Should this be the fundamental requisite for Sida funding, MEKARN would not qualify. However, MEKARN is well in the forefront of research as regards developing and adapting methods, techniques and other means of production of relevance for poor, livestock based farming systems in the region. In view of the overriding poverty reduction objective for Swedish development cooperation, the team concludes that MEKARN relevance is fully satisfactory.

Having an integrated design, it addresses aspects related both to livestock production and to crops, agro-forestry and aquaculture, of which the latter two should be further expanded. Its focus on sustainable, environment friendly production systems is another programme strength. The programme is well in line with CGIAR MGD:s.

Another lesson concerns the contribution to capacity building. Operations have so-far during the ongoing second MEKARN phase produced fully satisfactory results in terms of both capacity building and research findings. In this respect, MEKARN can also be seen as a contribution to the present policy discussion about the choice of different kinds of channels for SAREC support. Belonging to the so-called thematic group of setups, it has proven its role both as a focussed research network and as an effective contributor to capacity building at the national level, a task that usually is attributed to SAREC's bilateral programmes.

A third lesson refers to the challenge of dissemination. Experiments viewed by the team were well designed and well performed, using the necessary chemical and statistical analytical procedures, being implemented on farm level with resulting benefits for participating farmers. The publications were generally well written. Although programme activities thus have demonstrated an impact in terms of new production methods and systems, the dissemination of research findings at the national level outside the vicinity of individual universities is a weak link and needs more attention. Efforts are being made, but there is still a considerable scope for increase. The team does not ascribe responsibility for dissemination to the programme, but sees a need for additional efforts at linking, particularly into national extension services. Also links to the bilateral Sida programmes are quite few.

Fourthly, the team finds a lesson in the results of the MEKARN gender objective. The MSc:s and PhD:s trained by the programme have generally returned to good positions after their graduation.
The gender aspect was raised in Sida's project assessment in 2004. Good results are reported, female students making up almost 40% of graduated MSc:s, seven out of eleven presently registered PhD-candidates at SLU being women. Women trained state the importance of their training also for building up their self-confidence, critical thinking and independence.

Another issue raised by Sida in 2004 was the publication of research results in international journals. Papers published from MSc theses generally appear in an internet based, peer reviewed scientific journal with a specific focus on agriculture in developmental countries. The team finds this a good policy, allowing results to be spread to a relevant forum as well as rather rapidly internationally.

The papers from the PhD theses are published in conventional peer-reviewed scientific journals, some with specific focus on tropical agriculture or a certain region. The journals in question are generally among the 40% most cited in their respective category. The publication record of the programme can therefore be considered quite satisfactory.

Sida's 2004 project assessment postulated that "Knowledge can be shared effectively through this type of programme". The evaluation team concurs. It is a lesson of this programme that students from different countries learn and continue to work together, in research or otherwise. Further, the programme setup offers students from different countries an opportunity to learn and develop both in neighbouring and in distant countries. The result is a richer and in several ways more varied learning process.

A sixth lesson is that the similarities and constraints shared by the participating countries make them suitable for close cooperation. The vision is to create a group of cooperating scientists who can have an impact on the future research agenda and development in the region. Differences in the number of qualified staff between countries and between universities within one country may pose a constraint today, but an increasing number of researchers in the region can help to alleviate these differences. In view of the present financing prospects in the region, however, the network would need a continued financial support from Sida, something that should, evidently, as far as possible be combined with regional resource and sources.

A window of opportunity may be there for the partners to this cooperation. The two governments of Thailand and Vietnam allocate resources for academic exchange with neighbouring countries, not least Cambodia and Laos. The team has concluded that a next phase of MEKARN cooperation should build on a strengthened regional financial participation, integrating additional contributions from Thailand and Vietnam.

Lesson number seven concerns the outcome for different countries. In several respects, there is presently a built-in priority for Cambodia and Laos as regards the division of resources, if compared, for example, to population. The team appreciates this, but wishes to see both the design and the outcome of operations even more clearly in terms of development needs. Here, it is the team's conclusion that a stronger priority for Cambodia and Laos should be the basis for the planning of a third phase of MEKARN, both in terms of the number of participants and in other respects.

An important question for the evaluation has been the issue of phasing out the participation of SLU in the MSc-training and in the award of the degree. The team sees the lesson here that, although it is possible for the Nong Lam University at Ho Chi Minh City both to give the training and to award the degree, the support from SLU is still needed in order to guarantee a high level of training, linked to the international subject level, and to give an internationally competitive degree. In a next phase, the share of lecturers from SLU in MSc-courses can, and should, be further decreased, their efforts being concentrated on giving advanced courses, and on PhD and post-doc training. Both SLU and the other international lecturers and supervisors are highly appreciated for their contributions to the programme. A particular mention should be made of the participation of Dr. Reginald Preston.

As stated, regional networking is a key issue in the MEKARN cooperation, both as a focussed research network and as an effective contributor to capacity building at the national level. A ninth lesson is that this model could also be relevant for other areas of research cooperation in this region, offering an interesting way of supplementing or sometimes even substituting bilateral programmes.

The summary conclusions of the evaluation team are that programme capacity building objectives have been fully met, research objectives have been met almost fully, and that MEKARN thus has improved the livelihood of poor farmers and has contributed to poverty alleviation.

6. Recommendations

Based on the findings and conclusions presented above, the evaluation team presents the following recommendations.

1. Support for a third phase of MEKARN cooperation as a regional activity, focusing on livestock based sustainable farming systems should be considered.
2. The MSc-training should continue and be expanded, particularly as regards participation from Cambodia and Laos.
3. The gender perspective should remain in focus.
4. The MSc-training should maintain its high level, and give the students a good insight into integrated production systems with the focus on livestock based production systems, and give them a solid training in animal nutrition and production.
5. SLU should retain the ultimate responsibility for the MSc-training and for awarding the degree.
6. The participation of lecturers from the region in the MSc-training should be increased.
7. The PhD-training should continue.
8. For the PhD-training, SLU should maintain or increase its number of highly qualified and dedicated supervisors.
9. To maintain a high scientific level among graduated PhDs and a critical mass of scientists in the region, it could be considered to give advanced courses for post-docs and possibly PhD-students with the help of SLU and other international expertise.
10. On the research agenda, poultry should be restarted. Aspects on how to protect birds from bird influenza outbreaks ought to be considered.
11. Research on fish nutrition and integrative systems with livestock, bio-digestors, fish and vegetable production should be expanded.
12. In the future, when the first phase of feed evaluation and animal production and performance projects come to an end, the research agenda should be broadened.
13. Networking activities should be given a strong support, as they strengthen not only skills, but also the critical mass and the possibilities for cooperation in the region.
14. The MEKARN partners should be invited to plan for a third programme phase, where the operational and financial participation is broadened, particularly from Thailand and Vietnam, and where the level of contribution to capacity building in Cambodia and Laos is raised. The objectives of the cooperation should be quantified.
15. It might be considered whether not additional components of Sida/SAREC-financed bilateral research cooperation programmes could not preferably be reformulated in a regional framework.

Annex 1 Terms of Reference

1. Background

In year 2000 a regional research cooperation for livestock-based sustainable farming systems was established in the Lower Mekong Basin (Vietnam, Thailand, Laos and Cambodia) with support from Sida. In total 13 Universities and research institutes in the region (Vietnam, Laos Cambodia and Thailand) participates coordinated by the Nong Lam University, HoChi Minh City, with assistance from the Department of Animal Nutrition and Management, SLU (Swedish University of Agricultural Sciences). The cooperation includes training at PhD as well as MSc level, a research fund and networking activities. The first three-year phase of the program received a funding of totally 19,5 Msek. The current agreement last to 31th December 2007 and amounts to 32,5 msek out of which SLU budget was 10,5 msek.

Justification of the regional approach was similarities among the four participating countries in terms of agro-ecological conditions as well as constraints and opportunities for research focused on small-holder agriculture. According to the programme document (2000) a reason for the current support was the bias in agriculture research and trainig towards large scale conventional production systems which had proved to be succesful in industrialised countries. The objective was to strengthen regional cooperation in research, training and dissemination of information on livestock as the epicentre of sustainable farming systems.

No external evaluation of the programe has been made. However, the annual follow up gives at hand that the programe has been running according to plans. By and large quantitative results after the first phase ending in 2003, commensurate with expectations and it was too early to make an assessment of the impact on development objectives. Minutes from steering committee meetings, composed of representatives from all participating institutions, revealed, however, no major shortcomings. Sida repetitive also assisted some of the annual meetings. By 2003 totally 51 projects had received funding in competition, of about 50,000 sek each, out of which 40% were female researchers. Five thematic sub-networks had been established; scavenging poultry, buffaloes in integrated farming systems, tree foliage for goats, forage for pigs and low –cost biodigestor. In the first phase about 70% of the budget was used for networking activities and no inaccuracies were found in an external audit. In 2003 the first batch of 17 students graduated and most of these were employed at their institutions of origin in different capacities.

In a desk assessment made by Sida prior to the current phase also qualitative targets of regional knowledge sharing were met. Training at MSc level had been necessary to expand the recruitment base of PhD candidates in the first phase. It was anticipated that the program in the second phase would be able to work more as platform for regional research. Some concerns were raised and the topics identified to follow by Sida were;

- phasing out of the SLU MSc –degree and their coordination
- assessment of dependence on international expertise and funding of networking activities
- collaboration with research councils for funding (and advice)
- procedures of operation when the Steering Committee awards grants
- number of publications in international and regional scientific journals
- influence or impact on the scope and orientation of the national research agendas
- impact on policies affecting practices in farming systems
- environmental degradation versus economic performance
- problem conceptualization from a gender perspective

2. Scope and purpose of the evaluation

The scope of this evaluation is to situate the regional program approach within the global context and debate on livestock-based sustainable farming system research as a mean to reduce poverty, both in a rural as well as an urban setting. Is there a regional justification, and on what grounds? And, if so, how is this articulated in national strategies and policies? Given that two of the four countries in the program, namely Vietnam and Laos, have had Swedish bilateral cooperation in adjacent thematic areas during the same period have their been any synergies from the two modes of cooperation? If not, should there have been?

The evaluation should assess to what extent the program has been able to link the national research in the region with the regional and global debate and research agenda. On a global level the CGIAR (Consultative Group on International Agriculture Research) system has identified a number of priorities where livestock is identified as a strategic issue for reducing rural poverty through agricultural diversification and emerging opportunities i.a. conservation of indigenous livestock as well as genetically enhancing selected high-value species or traits; increasing livestock based incomes (including high-input high-output); agro-ecological intensification in low and high potential area; and making international and domestic markets work for the poor (ILRI, IFPRI). Among other topics highlighted by the international global research community is the livestock-human related diseases.

Another scope of the evaluation is to assess how the program participants have interpreted the mission with regard to individual as well as institutional capacity enhancement at different Universities and countries given the existing discrepancy in current standard and competence.

What are the the merits and drawbacks of having SLU accreditation of MSc degrees both for the execution of the program as well as for the development of the Swedish resource base? Has the program been able to create a common understanding among participating countries for harmonization of training as well as research agendas? If this is the case where is the emphasis on "teaching or research Universities", or are there other strategies?

The evaluation should also assess the national financial contributions to the program as well as the likelihood and prospects of acquiring a, if applicable – larger, government, private sector or regional (i.e. AsDB) funding. With regard to funding the mission should discuss if there are some part of the research or/and training which would be more appropriate for the private commercial than the government sector.

With regard to terminology the OECD (2002) definitions of the five evaluations should be used. Briefly, they read as follows:

Effectiveness is the extent to which the development intervention's objectives were achieved, or are expected to be achieved, taking into account their relative importance.

Impact is the positive and negative, primary and secondary long-term effects produced by a development intervention, directly or indirectly, intended or unintended.

Relevance is the extent to which the objectives of a development intervention are consistent with beneficiaries' requirements, country needs, global priorities and partners' and donors' policies. Retrospectively, the question of relevance often becomes a question as to whether the objectives of an intervention or its design are still appropriate given changed circumstances.

Sustainability is the continuation of benefit from a development intervention after major development assistance has been completed.

Efficiency is a measure of how economically resources/inputs (funds, expertise, time, etc.) are converted to results.

3. The assignment

Most of the concern and topics raised in 2003 are still relevant, namely to assess and evaluate;

Capacity building

- quantity and quality of MSc and PhD theses
- preliminary mappping of employment of graduated students
- quantity and quality of training courses
- relevance of themes and subjects
- the SLU coordination of training at MSc and PhD level
- hinderance to replace the SLU MSc–degree by a national/regional degrees

Cutting-edge science

- number of of publications in international and regional scientific journals
- the SLU overall performance to support and develop national/regional efforts to develop their research agenda based on the global debate and research agenda
- dependence on international expertise and funding of research activities
- contribution to the international research dialog
- program efforts to map and identify potential collaboration and contact with other research councils for funding like joint calls and/or advice on research management
- procedures of operation when the Steering Committee awards grants
- program efforts to raise funds from the private sector or regional banks (AsDB)

University information to development activities

- influence or impact on the scope and orientation of the national policies and the national public debates
- publication strategies in terms of scientific publications, policy briefs, booklets, etc.
- impact on regulation, credit facilites for investment in livestock-related activities, subsidices or other activites affecting livestock practices in farming systems
- environmental degradationor (i.e. pollution) versus economic performance and production efficiency
- livestock problem conceptualization from a gender perspective

4 Methodology, evaluation team and time schedule

Site visits (Vietnam, Laos Cambodia and Thailand) and interviews

It is expected that at least one member of the team visits at one University in all four countries of the program. During the visits the evaluators shall carry out in-depth interviews with key persons at Universities as well as with a sample of researcher's who been awarded grants from the research fund, as well as with some MSc and PHD students. Meetings or/and in-depth individual interviews with steering committee members should also be organized. If possible and considered relevant external referees should also be contacted to have their views on the quality of work and modes of operations.

Publications to read

The team shall read most of the publications produced by the program since 2000, including PhD and MSc theses. As well as relevant policy papers issued by the CGIAR system (ILRI and IFPRI) as well as regional structures.

Division of labor between the team members

The team leader is the overall responsible for the opinion of the team. In case of diverging opinions the team leader is responsible for a conclusive opinion. Furthermore the team leader should be responsible for an assessment of the justification of a regional approach and a discussion on synergies between the bilateral and regional approaches. He would further be the main responsible for assessment of the steering committee operations as well as on the financial procedures. The other two members will be responsible for their specific area of competence, which would also include to be informed on major shift in global polices on these topics and to analyze how these changes has been integrated in the program.

Reporting

The team leader is responsible for the three members to deliver reports according to agreed time schedule; preliminary report at the 31th December 2006 and a final report before the 15th of January 2007.

Annex 2 Acronyms and Abbreviations

CGIAR	Consultative Group on International Agricultural Research
CTU	Can Tho University, Can Tho
CIAT	International Centre for Tropical Agriculture
CMU	Chiang Mai University,, Chiang Mai, Thailand
CelAgrid	Centre of Liverstock and Agriculture Development, Cambodia
HUAF	Hue University of Agriculture and Forestry, Hue
ICRAF	World Agroforestry Centre
IFPRI	International Food Policy Research Institute
ILRI	International Livestock Resarch Institute
IPGRI	International Plant Genetic Research Institute
KKU	Khon Kaen University, Thailand
MARD	Ministry of Agriculture and Rural Development, Vietnam
MEKARN	Research Cooperation for Livestock-based Sustainable Farming Systems in the Lower Mekong Basin
MOST	Ministry of Science and Technology, Vietnam
NAFRI	National Agriculture and Forestry Research Institute, Laos
NIAH	National Institute of Animal Husbandry, Hanoi
NLU	Long Nam University (new name of UAF)
NUOL	National University of Laos
PSU	Prince of Songkla University, Hat Yai, Thailand
RUA	Royal University of Agriculture in Phnom Penh, Cambodia
SLU	Swedish University of Agricultural Sciences
Sida	Swedish International Development Agency
SAREC	Swedish Agency of Research Cooperation, now Sida's research department
UTA	University of Tropical Agriculture in Phnom Penh, Cambodia
UAF	University of Agriculture and Forestry, Ho Chi Minh City

Annex 3 Persons Met during the mission

Date	Activities	Persons met
In Sweden		
Oct, 17 A-HT Mha	Meeting with evaluation team in Uppsala	Brian Ogle, PhD students from Vietnam (Len, Thieu), Laos (Oudom), and one PhD student from Cambodia (Seng Sokerya).
Oct, 20 Krister, Mha	Meeting with Sida/SAREC	Robert Nygard
Oct, 23	Meeting of the evaluation team	Krister Eduards, Minh Ha
Oct, 26 Krister, Mha	Meeting with MEKARN/SLU	Brian Ogle, Inger Ledin, PhD students from Vietnam, Laos, Cambodia
In Vietnam		
Nov, 10 Minh Ha	Meeting ILRI Vietnam at MARD	Dr. Lucy Lapar, ILRI Vietnam
Nov, 21–22[6] The team	Scientific committee meeting and Stakeholders workshop in HCM city	Scientific committee members, Country and Mekarn coordinators, advisor, network members and graduated PHD from MEKARN: Dr. Trong Hieu, Dr. Ngo Van Man, Dr. Brian Ogle, Dr. Reginald Preston, Dr. Metha Wanapat, Dr. Bounthong Bouahom, Dr. Khieu Borin, Dr. Vo Chi Cuong, Dr. Thongsay Sichanh, Mr. Fongsamouth Southammavong Prof. Le Viet Ly (Mekarn advisor). Network member: Mr. 'Nguyen Van Cong
Nov, 23 The team	Visit to NLU, laboratory and MEKARN office, and research experiment station	Dr. Trinh Truong Giang, Vice rector of NLU Dr. Man, Dr. Preston, Prof. Hieu, Dr. Khang
Nov, 24–25 Minh Ha	Visit to MARD-National agricultural extension center (NAEC)	Ms. Tran Kim Anh, deputy director of NAEC. National component coordinator of ASPS-small livestock component
	Dept of Livestock at MARD	Dr. Hoang Kim Giao, Deputy director of the Dept Mr. Nguyen Xuan Duong, officer
	Dept of science and technology at MARD	Mr. Nguyen Viet Hai, Officer at the Dept
	Institute of Policy and Strategy for Agriculture and Rural Development (IPSARD) at MARD	Dr. Do Anh Tuan Mr. Hoang Dinh Quoc.
	Contact Swedish Embassy for a meeting	Mr. Mats Bengtsson and Dr. Ha, responsible for SAREC works at the Swedish Embassy
Nov, 24 KE A-HT Dr. Preston Dr. Man	Meeting with the Hue University of Agriculture and Forestry	Dr. Hoang Manh Quan, Vice Rector Dr. Le Duc Ngoan, Dr. Le Van An Dr. Nguyen Thi Hoa Ly, Senior Lecturer University lecturers MEKARN researchers

[6] The team, Krister Eduards, Anne-Helene Tauson, and Minh Ha Fagerstrom, was accompanied by Dr. Man and Dr. Preston.

Date	Activities	Persons met
Nov, 25, Am The team Dr. Preston Dr. Man	Meeting at NIAH	Dr. Vu Chi Cuong, deputy diretor of NIAH. Mr. Pham Si Tiep and Mr. Nguyen Manh Dung – Dept of scientific management and international cooperation. Mr. Dinh van Tuyen, deputy head of Dept of cattle research. PhD students and graduated PhD: Thang, Minh, Van, Giang. MS student: Bich Ngoc
Pm A-HT Mha Dr. Preston	Visit to Ba Vi rabbit and goat research station of NIAH, and two farms	Dr. Nguyen Kim Lin, deputy director of Ba Vi station. Two MSc graduated and students. Dr. Man, Dr. Preston.
KE	Visit to MOST (Ministry of Science and Techn.)	Dr. Tran Dzung Tien, Senior Officer
KE	Visit to Sida at Swedish Embassy	Mr. Rolf Samuelsson, Senior Programme Officer
In Laos		
Nov 26 The team	Nam Xuan livestock research station (LRC) at NAFRI	Mr. Soukanh Keonouchanh. Diretor of LRC A MSc student (Ammaly)
pm	Meeting with NAFRI	Dr. Buonthong Buonhom Dr. Dr. Soukanh Keonouchane, Director
Nov 27 am The team	Meeting at Nabong, Faculty of Agriculture of NUOL. V	Mr. Thongly Sayyachack, vice Dean of Faculty of agriculture, NUOL. Mr. Fongsamouth Southammavong, Lecturer Three MSc students at NUOL (Daovi, Malavan, Khamparn). One MSc student from the Aquatic Research Station (Latamy).
Anne-Helle Minh Ha	Visit to research station at NUOL	Laboratory, and research station staff, MSc students.
Krister	Visit to Social Science Dept at NUOL	Dr. Siliuthone Sacklokham, Chief of department
	Visit to Mekong steering committee	No appointment
pm The team	Meeting at MAF National Agriculture and Forestry Extension Service (NAFES)	Dr. Tiene Vannasouk Deputy Director General of NAFES.
In Cambodia		
Nov, 28–29 The team	See the agenda in Cambodia attached below	
In Vietnam		
Nov, 30 Am The team	Meeting at Can Tho University. Visit to library and experimental station	Dr. Do Van Xe, Vice Rector, Graduated PhD (Dr. Men, Dr. Thu, Dr. Kim Dong). Dr. Thu is head of the Dept of Livestock management of Can Tho university, PhD student (Ms Thuy), two MSc students (Mr Nha, Tham), researchers who got research funding from MEKARN (Mr. Thiet)
Pm The team	Meeting with Prof. Vo Tong Xuan at Can Tho university office in HCM	Prof. Vo Tong Xuan, Rector of An Giang university.
The team	Briefing the main outputs of the evaluation team at Can Tho university office in HCM	Prof. Hieu, Dr. Man, Mr. Cong, Prof. Vo Tong Xuan
Dec, 5 Minh Ha	Meeting with ILRI team from Nairobi	Dr. Jan Wright, Coordinator of ILRI in Asia. Dr. Lucy Lapar, ILRI Vietnam

Agenda for the MEKARN Evaluation team in Cambodia, November 28–29, 2006

Time and date	Places	Persons	Others
November 28, 2006			
14:30–17:30	Visit CelAgrid activities and interview – Dr. Anne Helene Tauson, – Dr. Minh Ha Hoang Fagerstrom, – Dr. Thomas Reg Preston,	– Ms. Seng Sokerya – Mr. Pok Samkol – Mr. Chiv Phiny – Mr. Teung Kouch – Mr. San Suyheang – Mr. Pheng Buntha – Mr. Keo Sath (MEKARN MSc and PhD students from CelAgrid and RUA)	
15:00–16:00	Council of Ministers – Dr. Krister Eduards, – Dr. Ngo Van Man	Dr. Sen Sovann, Adviser to Deputy Prime Minister on Agriculture	
16:00–17:00	Heifer Project International Cambodia – Dr. Krister Eduards, – Dr. Ngo Van Man	Mr. Ho Bunyeth, HPI Program Coordinator, MEKARN MSc graduate	
18:30	Dinner at Mlob Sbov across Mekong	– Evaluation team – CelAgrid staff – Mr. Ho Bunyeth, HPI program Coordinator – Mr. Kean Sopheap, CelAgrid Board member – Mr. Sao Sopheap, FAO Rep Assistant and CelAgrid Board member	
November 29, 2006			
08:00–09:00	Cambodian Australian Agricultural Extension Project, CAAEP/DAE/MAFF – All team members	Mr. Terry O'Sullivan, Team Leader, CAAEP	
09.00–10.00	Department of Agricultural Extension, MAFF – All team members	Mr. So Khan Rithykun, Director of DAE	
10:00–11:00	The Embassy of Sweden in Phnom Penh (#8, St. 352, BKK1, PP) HP: 016 744 544 – All team members	Ms Eva Smedberg, Counsellor	
11:00	Departure to airport	Evaluation team members	Dr. Khieu Borin

Annex 4 Working Situation of Graduated MEKARN MSc Students

Vietnamese MSc students

	Full name	Graduated year	Position/institution and address
1	Mr. Ngo Tien Dung	2003	Vietnam Belgium Dairy project, Ministry of Agriculture and Rural Development
2	Mrs. Hoang Huong Giang	2003	PhD candidate 2005 Department of Animal Nutrition and Management. Swedish University of Agricultural Sciences
3	Mrs. Tran Thi Thu Hong	2003	PhD candidate 2004 Department of Animal Nutrition and Management. Swedish University of Agricultural Sciences
4	Mrs. Nguyen Thi Kim Khang	2003	PhD candidate 2003 Bonn University, Germany Graduated at the end of 2006
5	Mr. Vo Lam	2003	PhD candidate 2005 Department of Animal Nutrition and Management. Swedish University of Agricultural Sciences
6	Mrs. Nguyen Thi Thuy	2003	PhD candidate 2006 Department of Animal Nutrition and Management. Swedish University of Agricultural Sciences
7	Mrs. Nguyen Duy Quynh Tram	2005	PhD candidate 2006 Department of Animal Nutrition and Management. Swedish University of Agricultural Sciences
8	Mrs. Bui Phan Thu Hang	2005	Lecturer Faculty of Agriculture and Natural Resource An Giang University
9	Mrs. Le Thuy Hang	2005	Lecturer Faculty of Agriculture and Natural Resource An Giang University
10	Mr. Chu Manh Thang	2005	PhD candidate 2006 Department of Animal Nutrition and Management. Swedish University of Agricultural Sciences
11	Mrs. Ly Thi Luyen	2005	Researcher Ba Vi Goat and Rabbit Research Center National Institute of Animal Husbandry
12	Mrs. Ngo Thuy Bao Tran	2005	Lecturer Faculty of Agriculture and Natural Resource An Giang University

Laos MSc students

	Full name	Graduated year	Position/institution and address
1	Mr. Keoboualapheth Chanphone	2003	Deputy Director Luang Prabang School of Agriculture
2	Mr. Vongsamphan Phanthavong	2003	Department of Livestock Ministry of Agriculture and Forestry, Vientiane
3	Mr. Phengsavanh Phonepaseuth	2003	CIAT project regional coordinator L4P National Agriculture and Forestry Research Institute, Vientiane
4	Mr. Novaha Soulivanh	2003	Died
5	Ms. Keansombath Lampheuy	2005	PhD candidate 2006 Department of Animal Nutrition and Management. Swedish University of Agricultural Sciences
6	Mr. Phimmasan Hongthong	2005	Head of Xieng Khoang Livestock Station
7	Mr. Xaypha Sopha	2005	Researcher Livestock Research Center (Nam Xuan) National Agriculture and Forestry Research Institute, Vientiane
8	Mr. Khoutsavang Bounlieng	2005	Vice Director Livestock Research Center (Nam Xuan) National Agriculture and Forestry Research Institute, Vientiane

Cambodian MSc students

	Full name	Graduated year	Position/instution and address
1	Mr. Prak Kea	2003	FAO, HPAI project, Trainer
2	Mr. Theng Kouch	2003	Lecturer Royal University of Agriculture
3	Ms. Seng Sokerya	2003	PhD candidate Department of Animal Nutrition and Management. Swedish University of Agricultural Sciences
4	Mr. San Thy	2003	ECOSORN/EU Ministry of Agriculture, Forestry and Fischery
5	Mr. Chhay Ty	2003	Center for Livestock & Agriculture Development Cambodia Research coordinator
6	Mr. Ho Bunyeth	2005	Heifer International program coordinator Phnom Penh
7	Mr. Miech Phalla	2005	Center for Livestock and Agriculture Development Research officier
8	Mr. Sorn Suheang	2005	Lecturer Royal University of Agriculture
9	Mr. Pok Samkol	2005	Center for Livestock and Agriculture Development Research officier

Thailand MSc students

	Full name	Graduated year	Position/instution and address
1	Mr. Promkot Chamnanvit	2003	Position: Lecturer, PhD training, USA Address: Sakonnakhon Agricultural Research and Training Center, Rajamangala University of Technology Isan Sakonnakhon Campus. Pungkon, Sakonnakon, 46170 Thailand.
2	Mr. Kiyothong Krailas,	2003	Position: PhD training, UK Address: Khon Kaen Animal Nutrition Research and Development Center, Khon Kaen, 40260 Thailand.
3	Mr. Chantaprasarn Boonchan	2005	Position: Extension worker Address: Dairy Farming Promotion Organization of Thailand (DPO) 344 Moo 15 Thapra, Muang District Khon Kaen 40260,Thailand.
4	Mr. Ngamsaeng Amorsak	2005	Position: Extension worker Address: Bank for Agriculture and Agricultural Cooperatives, Srisakat, Thailand.

Annex 5 Publications from the MEKARN Cooperation 2003–2006

Journal	Access	Publisher	Number of papers	Impact factor 2005	Database CAB	Impact factor 2001–2004
Livestock Research for Rural Development	Free internet access	Centro para la Investigación en Sistemas Sosteniblesde Producción Agropecuaria, Cali, Colombia (NGO)	53	-	Yes	
Asian-Australasian Journal of Animal Science	Not free internet access.	Asian-Australasian Association of Animal Production Societies (AAAP) and Korean Society of Animal Science and Technology (KSAST).	8 + 1 submitted	2005: 0.854 Ranked as the 18th most cited Journal in 2005 in the Category Agriculture, Dairy and Animal Sciences (43 in category) (ISI category)	Yes	2004: 0.627 2003: 0.445 2002: 0.247 2001: 0.268
Tropical Animal Health and Production	Not free internet access	published in association with the Centre for Tropical Veterinary Medicine, University of Edinburgh-Dordrecht Kluwer Academic Publishers	7	2005: 0.425 Ranked as the 75th most cited Journal in 2005 in the Category veterinary science (129) (ISI category)	Yes	2004: 0.323 2003: 0.258 2002: 0.311 2001: 0.235
Animal Feed Science and Technology	Not free internet access	Elsevier Publ. Co	4	2005: 1.121 Ranked as the 13th most cited Journal in 2005 in the Category Agriculture, Dairy and Animal Sciences (43) (ISI category)	Yes	2004: 0.895 2003: 0.858 2002: 0.783 2001: 0.728
Journal of Sustainable Agriculture	Not free internet access	HAWORTH PRESS INC	1	2005: 0.376 Ranked as the 17th most cited Journal in 2005 in the Category Agriculture, Multidisciplinary (31) (ISI category)	Yes	2004: 0.189 2003: 0.194 2002: 0.169 2001: 0.099
Animal Science	Not free internet access	CABI PUBLISHING	1	2005: 1.005 Ranked as the 15th most cited Journal in 2005 in the Category Agriculture, Dairy and Animal Sciences (43) (ISI category)	Yes	2004: 0.941 2003: 0.951 2002: 0.879 2001: 1.082
Field crops research	Not free internet access	ELSEVIER SCIENCE BV	1	2005: 1.241 Ranked as the 13th most cited Journal in 2005 in the Category Agronomy (48) (ISI category)	Yes	2004: 1.243 2003: 1.027 2002: 1.302 2001: 1.379

Journal	Access	Publisher	Number of papers	Impact factor 2005	Database CAB	Impact factor 2001–2004
Ethiopian Journal of Animal Science	Journal not found on the internet	?	1		No	
Proceedings of the VII Regional Meeting on Nutrition and Production of Monogastric animals	Proceeding not found on the internet	?	1		No	

Annex 6 Citation Index for MEKARN Publications 2000–2006

Article	Times cited	Source
Dong N T K and Ogle R B 2003. Effect of brewery waste replacement of concentrate on the performance of local and crossbred growing Muscovy ducks. Asian-Australasian Journal of Animal Sciences. 16 (10): 1510-1517.s	1	Smith BM, Ross CC, Walsh JL (2004); Food-processing wastes. Water Environment Research 76 (6): 1589-1650 2004
Dong N T K and Ogle R B 2004. An evaluation of brewery waste as a replacement for concentrates in diets for growing crossbred common ducks. Tropical Animal Health and Production. 36 (7): 715-729.	0	
Dong N T K, Elwinger K, Lindberg J E and Ogle R B 2005. Effects of replacing soybean meal with soya waste and fish meal with ensiled shrimp waste on the performance of growing crossbred ducks. Asian-Australasian Journal of Animal Sciences. 18 (6) 825-834	1	Lim KS, You SJ, An BK, et al. (2006); Effects of dietary garlic powder and copper on cholesterol content and qualityy characteristics of chicken eggs. Asian-Australasian Journal of Animal Sciences 19 (4): 582-586
Do Thi Thanh Van, Nguyen Thi Mui, Inger Ledin. 2004. Effect of method of presentation of different foliages given separately or in mixtures on intake and behaviour of goats. Animal Feed Science and Technology (In Press). (2005, 118:1-17) (Tropical foliages: effect of presentation method and species on intake by goats)	1	Van DTT, Mui NT, Ledin I (2006): Effect of method of processing foliage of Acacia mangium and inclusion of bamboo charcoal in the diet on performance of growing goats. Animal Feed Science and Technology 130 (3-4): 242-256
Do Viet Minh, Le Viet Ly and B. Ogle. 2004. Effects of energy and protein supplementation on the production and economic efficiency of scavenging improved (TamHoang) and local (Ri) breed hens under smallholder conditions in North Vietnam. Tropical Animal Health and Production, 36 (2004), 703-714.	1	Borin K, Lindberg JE, Ogle RB (2006): Digestibility and digestive organ development in indigenous and improved chickens and ducks fed diets with increasing inclusion levels of cassava leaf meal. Journal of Animal Physiology and Animal Nutrition 90 (5-6): 230-237
Do Viet Minh, Jan Erik Lindberg and Brian Ogle. 2004. Effect of Scavenging and Protein Supplement on the Feed Intake and Performance of Improved Pullets and Laying hens in Northern Vietnam. Asian-Australasian Journal of Animal Sciences, 17 (11), 1553-1561.	2	Minh DV, Lindberg JE, Ogle B (2006): Effect of season and location on the crop contents of local and improved scavenging hens in northern Vietnam. Tropical Animal Health and Production 38 (2): 121-129 Minh DV, Ogle B (2005): Effect of scavenging and supplementation of lysine and methionine on the feed intake, performance and carcase quality of improved dual-purpose growing chickens. Tropical Animal Health and Production 37 (7): 573-587
Do Thi Thanh Van, Ledin I and Nguyen Thi Mui 2002. Feed intake and behavior of small ruminants fed whole sugar cane as a sole roughage with or without concentrate. Animal Feed Science and Technology 100:1-2,79-91.	1	Ramli MN, Higashi M, Imura Y, et al. (2005): Growth, feed efficiency, behaviour, carcass characteristics and meat quality of goats fed fermented bagasse feed. Asian-Australasian Journal of Animal Sciences 18 (11): 1594-1599

Article	Times cited	Source
Duong Nguyen Khang and Wiktorsson H 2000. Effects of cassava leaf meal on the rumen environment of local yellow cattle fed urea-treated paddy straw. Asian-Aus. J. Anim. Sci. 13: 1102-1108	5	Khang DN, Wiktorsson H, Preston TR (2005): Yield and chemical composition of cassava foliage and tuber yield as influenced by harvesting height and cutting interval. Asian-Australasian Journal of Animal Sciences 18 (7): 1029-1035 Khang DN, Wiktorsson H (2004): Effects of fresh cassava tops on Rumen environment parameters, thyroid gland hormones and liver enzymes of local yellow cattle fed urea-treated fresh rice straw. Tropical Animal Health and Production 36 (8): 751-762 Khang DN, Wiktorsson H (2004): Effects of ensiled cassava tops on rumen environment parameters, thyroid gland hormones and liver enzymes of cows fed urea-treated fresh rice straw. Asian-Australasian Journal of Animal Sciences 17 (7): 936-941 Kiyothong K, Wanapat M (2004): Supplementation of cassava hay and stylo 184 hay to replace concentrate for lactating dairy cows. Asian-Australasian Journal of Animal Sciences 17 (5): 670-677 Hong NTT, Wanapat M, Wachirapakorn C, et al. (2003): Effects of timing of initial cutting and subsequent cutting on yields and chemical compositions of cassava hay and its supplementation on lactating dairy cows. Asian-Australasian Journal of Animal Sciences 16 (12): 1763-1769
Duong Nguyen Khang and Wiktorsson H 2004. Effects of ensiled cassava tops on rumen environment parameters, thyropid gland hormones and liver enzymes of cows fed urea-treated fresh rice straw. *Asian-Aus. J. Anim. Sci.* 17: 936-941	1	Lohakare JD, Pattanaik AK, Khan SA (2006): Effect of dietary protein levels on the performance, nutrient balances, metabolic profile and thyroid hormones of crossbred calves. Asian-Australasian Journal of Animal Sciences 19 (11): 1588-1596
Khieu Borin and B.E. Frankow-Lindberg. 2004. Effects of legumes-cassava intercropping for foliage and biomass production. Journal of Sustainable Agriculture (In Press) (2005-27:139-151	0	
Khieu Borin, Lindberg, J.E. and Ogle, R.B. 2005. Effect of variety and preservation method of cassava leaves on diet digestibility by indigenous and improved pigs. Animal Science 2005, 80: 319-324.	0	
Le Van An and Lindberg J E 2004. Ensiling of Sweet Potato Leaves (Ipomoea batatas (L.) Lam) and the Nutritive Value of Sweet Potato Leaf Silage for Growing Pigs. *Asian-Aust. J. Anim. Sci. 2004, Vol 17, No. 4: 497-503*	0	

Article	Times cited	Source
Le Van An, Lindberg B E F and Lindberg J E 2003. Effect of harvesting interval and defoliation on yield and chemical composition of leaves, stems and tubers of sweet potato (Ipomoea batatas L. (Lam.)) plant parts. *Field Crops Research. 82: 49-58.*	3	Van An L, Hong TTT, Ogle B, et al. (2005): Utilization of ensiled sweet potato (Ipomoea batatas (L.) Lam.) leaves as a protein supplement in diets for growing pigs. Tropical Animal Health and Production 37 (1): 77-88 Van An L, Hong TTT, Lindberg JE (2004): Heal and total tract digestibility in growing pigs fed cassava root meal diets with inclusion of fresh, dry and ensiled sweet potato (Ipomoea batatas L. (Lam.)) leaves. Animal Feed Science and Technology 114 (1-4): 127-139 Van An L, Lindberg JE (2004): Ensiling of sweet potato leaves (Ipomoea batatas (L.) Lam) and the nutritive value of sweet potato leaf silage for growing pigs. Asian-Australasian Journal of Animal Sciences 17 (4): 497-503
An, L.V., Hong, T.T.T., and Lindberg, J. E. 2004. Ileal and Total Tract Digestibility in growing pigs fed cassava root meal diets with inclusion of fresh, dry and ensiled sweet potato leaves. Animal Feed Science and Technology, 114, 127-139.	0	
An, L.V., Hong, T.T.T., Ogle, B. and Lindberg, J.E. 2004. Utilisation of ensiled sweet potato leaves as a protein supplement in diets for growing pigs. Tropical Animal Health and Production (In Press) (2005 37:77-88)	0	
Minh, D.V. & Ogle, B. 2005. Effects of Scavenging and Supplementation of Lysine and Methionine on the Feed Intake, Performance and Carcase Quality of Improved Dual-Purpose Growing Chickens. Tropical Animal Health and Production. 37 (2005) 1- 15.	1	Pousga S, Boly H, Lindberg JE, et al. (2006): Effect of supplementation on the feed intake and performance of confined and scavenging crossbred growing chickens in Burkina Faso. Tropical Animal Health and Production 38 (4): 323-331
Minh, D.V., Ly, L. V. & Ogle, B. 2004. Effects of Energy and Protein Supplementation on the Production and Economic Efficiency of Scavenging Improved (Tamhoang) and Local (Ri) Breed Hens under Smallholder Conditions in Northern Vietnam. Tropical Animal Health and Production. 36 (7) 703- 714.	1	Borin K, Lindberg JE, Ogle RB (2006): Digestibility and digestive organ development in indigenous and improved chickens and ducks fed diets with increasing inclusion levels of cassava leaf meal. Journal of Animal Physiology and Animal Nutrition 90 (5-6): 230-237
Minh, D.V., Lindberg, J.E. & Ogle, B. 2004. Effects of Scavenging and Protein Supplement on the Feed Intake and Performance of Improved Pullets and Laying Hens in Northern Vietnam. Asian-Australasian Journal of Animal Sciences. 17 (11), 1553-1561.	2	Minh DV, Lindberg JE, Ogle B (2006): Effect of season and location on the crop contents of local and improved scavenging hens in northern Vietnam. Tropical Animal Health and Production 38 (2): 121-129 Minh DV, Ogle B (2005): Effect of scavenging and supplementation of lysine and methionine on the feed intake, performance and carcase quality of improved dual-purpose growing chickens. Tropical Animal Health and Production 37 (7): 573-587
Ngo Tien Dung, Nguyen Thi Mui and Inger Ledin. 2004. *Effect of replacing a commercial concentrate with cassava hay (Manihot esculenta Crantz) on the performance of growing goats. Animal Feed Science and Technology (In Press).* (2005-119:271-281)	1	Van DTT, Mui NT, Ledin I (2006): Effect of method of processing foliage of Acacia mangium and inclusion of bamboo charcoal in the diet on performance of growing goats. Animal Feed Science and Technology 130 (3-4): 242-256

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Nguyen Thi Kim Dong and Ogle B 2003. Effect of brewery waste replacement of concentrate on the performance of local and crossbred Muscovy ducks. *Asian- Australasian Journal of Animal Sciences Vol 16, No 10: 1510-1517*	1	Smith BM, Ross CC, Walsh JL (2004): Food-processing wastes. Water Environment Research 76 (6): 1589-1650
Nguyen Thi Kim Dong and R. Brian Ogle. 2004. An evaluation of brewery waste as a replacement for concentrates in diets for growing crossbred common ducks. Tropical Animal Health and Production, 36 (2004), 715-729.	0	
Nguyen Trong Ngu and Inger Ledin. 2004. Effects of Feeding Wastes from *Brassica* species on Growth of Goats and Pesticide/Insecticide Residues in Goat Meat. Asian-Australasian Journal of Animal Sciences (In Press). (2005 18:197-202)	0	
Promkot C and Wanapat M 2004. Effect of level of cottonseed meal and protein in diets containing cassava chips and rice straw for lactating dairy cows. Submitted to Australasian Asian Journal of Animal Production.	3	Lohakare JD, Pattanaik AK, Khan SA (2006): Effect of dietary protein levels on the performance, nutrient balances, metabolic profile and thyroid hormones of crossbred calves. Asian-Australasian Journal of Animal Sciences 19 (11): 1588-1596 Khampa S, Wanapat M, Wachirapakorn C, et al. (2006): Effects of urea level and sodium DL-malate in concentrate containing high cassava chip on ruminal fermentation efficiency, microbial protein synthesis in lactating dairy cows raised under tropical condition. Asian-Australasian Journal of Animal Sciences 19 (6): 837-844 Khampa S, Wanapat M, Wachirapakorn C, et al.(2006): Effect of levels of sodium DL-malate supplementation on ruminal fermentation efficiency of concentrates containing high levels of cassava chip in dairy steers. Asian-Australasian Journal of Animal Sciences 19 (3): 368-375
Tran Thi Thu Hong, Nguyen Quang Linh, Ogle B and Lindberg J K 2006. Survey on the prevalence of diarrhoea in pre-weaning piglets, and on feeding systems as contributing risk factors in smallholdings in Central Vietnam. Accepted by Tropical Animal Health and Production. 38: 397-405	0	
Van, D.T.T., Ledin, I. & Mui, N.T. 2002. Feed intake and behaviour of kids and lambs fed sugar cane as the sole roughage with or without concentrate. Animal Feed Science and Technology 100 (1-2), 79-91	1	Ramli MN, Higashi M, Imura Y, et al. (2005): Growth, feed efficiency, behaviour, carcass characteristics and meat quality of goats fed fermented bagasse feed. Asian-Australasian Journal of Animal Sciences 18 (11): 1594-1599
Van, D.T.T., Mui, N.T. & Ledin, I. 2005. Tropical foliages: Effect of presentation method and species on intake by goats Animal Feed Science and Technology 118, 1-17	1	Van DTT, Mui NT, Ledin I (2006): Effect of method of processing foliage of Acacia mangium and inclusion of bamboo charcoal in the diet on performance of growing goats. Animal Feed Science and Technology 130 (3-4): 242-256

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