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Lesson learning study from the Vegetable Cluster with special emphasis on the links with the private sector

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Executive summary

A lesson learning study on the Crop Protection Programme's cluster of vegetable projects in East Africa with special emphasis on links with the private sector was carried out by a study team during November/December 2004. The main objectives of the study were to: identify how outputs from the CPP vegetable cluster have contributed to the needs of major stakeholders in the horticulture sector in Kenya; and to describe strategy, impact and management lessons learnt in terms of private sector engagement in horticulture in Kenya. Recent trends in the horticulture sector in Kenya were also considered as a guide for future research strategy and opportunities.

The study comprised two main activities: firstly, responses were sought to a questionnaire (Annex 1) sent to leaders, managers, advisors and/or collaborators on at least one project during the RNRRS 10 yr strategy and secondly, feedback was sought directly from major stakeholders in the horticulture sector during a one week visit to Kenya (Annex 6). The study team compiled 15 responses to the questionnaire, incorporated the feedback from major stakeholders in Kenya, synthesized the information, and identified important lessons learnt. It is expected that the output of this study will augment and feed into the RNRRS evaluation, provide important lessons for the final year of the programme, and guide future research strategy.

The vegetable crop protection projects were the first to be organised into an effective thematic cluster in 1997/8. During the following 5 yrs, considerable M&E was carried out through several cluster reviews, which demonstrated that the cluster was founded on thorough and well-grounded demand-led research. Strategic directional changes were made, in particular, CPP management made the decision to engage with the private sector for the promotion of research outputs. The vegetable cluster has had a more extensive interaction with the private sector than other CPP clusters and its approach novel amongst other agricultural research programmes.

Main lessons learnt regarding impact

The cluster of vegetable projects in Kenya, utilising a variety of approaches, is one of the most effective CPP clusters for contributing to reduction of poverty and improvement in livelihoods of poor small-holders working in both the domestic and export sectors and poor employees working in the export sector.

The most important outputs and achievements from the vegetable cluster projects can be divided into three main (and overlapping) areas: biopesticides, knowledge generation and promotion, and spill-overs. These have included: the successful development and promotion of biological control agents (esp. R8217, R8218); capacity building within the public and private research sectors and of farmers directly involved in projects (R8297); the facilitation of policy changes through the development of pioneering biopesticides legislation in Kenya - *the fact that Legal Notices are now in place a year after the CPP-funded Biopesticides Registration Workshop is considered to be a remarkable achievement by Kenyan stakeholders;* the development and wide promotion of attractive and effective promotional tools such as the handbooks, posters and calendars (R6764) which are also being used by many subsequent projects (see Figure 1); and the development of successful and effective public-private sector partnerships. It was also noted that these outputs will continue to be used long after the lifetime of the CPP.

Cluster achievements that were more likely to sustain on-going positive change in the horticultural sector were highlighted as the major achievements. We therefore wish to emphasize to the evaluation team and to DFID that the major achievements, impact and influence of the CPP will probably not be realized until the medium-term future.

CPP has been part of a broader effort to reduce pesticide use in vegetable production systems. Although currently more advanced in the export sub-sector, there is growing awareness in the domestic sub-sector regarding quality issues. *Most importantly, many farmers growing vegetables for both the export and domestic sub-sectors are practising export quality standards at farming system level to achieve traceability compliance, to the benefit of vegetables grown for the domestic sector*. CPP has played an important role in contributing to these growing spill-over effects.

R8297 has shown that small-holder out-growers for the export sector can adopt traceability systems and sound IPM and agricultural practices required under EUREPGAP and can be certified. *Export companies are therefore likely to retain their small-holder out-grower bases (and perhaps even increase the numbers) as continued involvement of a geographically diverse small-holder base is a) less costly and b) less risky*. Therefore, in contributing to the retention of small-holder out-growers in the export sector, *R8297 has directly contributed to reducing poverty amongst these farm families and their employees.*

The lack of promotional opportunities between the CPP and the DFID in-country advisers and programmes in Kenya hindered promotion and reduced the impact achieved by the vegetable cluster projects in Kenya. One notable exception is the recent linkage formed between R8297 and the DFID Business Services Management Development Programme (BSMDP) - *a rare example of a productive linkage between the DFID in-country programme and a DFID research programme.* The contribution from the BSMDP has added value to the CPP project. The experience has been a valuable and reproducible two-way learning process. The productive linkage should be a model for future DFID projects. More importantly, the concept of private sector providers has now been taken up by other donors training trainers and/or farmers to meet the EUREPGAP regulations. *Thus R8297 has stimulated/enabled others to provide more sustainable training input into the export horticulture sector in Kenya to ensure that as many small-holder out-growers as possible can remain in the sector – thus ensuring on-going contributions to reducing poverty and improving livelihoods.*

Main lessons learnt regarding strategy

CPP's unique thematic project cluster for the vegetable projects in East Africa was considered to be a useful and valuable system for keeping project teams well-informed. It was noted that it could be further improved by enhanced interactive planning across the cluster and greater information exchange across projects.

The transition from development of technologies or research outputs to promoting research outputs was considered to be abrupt and, in some cases, disruptive. At the same time, the transition was considered to be necessary in order to achieve uptake. The need to use all relevant and available means for promotion of outputs – public, private, NGO etc. – as has been done in the vegetable cluster projects was highlighted. The choice will depend on the technology, the situation, the country etc.

The importance of involving promotional partners and stakeholders in the research process itself to gain ownership of the outputs was emphasized.

The critical importance of working with the private sector once decisions were made by CPP management to give priority to developing biological control agents into biopesticides was highlighted. *Both research and commercial sector respondents noted that without a private sector partner, promotion of biocontrol agents developed by the CPP projects would have been near impossible.* It was noted that the private sector should have been involved earlier in the vegetable cluster projects. However, in the future due care should be taken to enable all appropriate private sector (and NGOs) to gain access to CPP projects and their outputs. This should take place in an open and transparent manner with the other research partners. DFID was considered to be slower and more timid than other donors to engage with the private sector in Kenya.

The CPP support for Dudutech, the original biological control company in Kenya, enabled *the transformation of research into reality*. The strategy was sound and the right choice was made: through engagement with the private sector the CPP has had critical influence on policy in Kenya and has effectively promoted outputs and stimulated uptake. CPP's small investment facilitated the development of important and pioneering biopesticides legislation has contributed to growth in interest and activities in biological control in the horticulture sector. The loss of staff from Homegrown and Dudutech has bolstered the capability of other companies in the sector. A new company - Real IPM - has been established and several export horticulture companies are mass-producing natural enemies. In addition, several South African companies are testing biopesticides in Kenya with a view to registration and sale.

There was agreement among stakeholders in Kenya that the development of a horticulture network, initially concentrating on vegetables, in East and Central Africa under ASARECA would be useful for coordinating the diverse and numerous research efforts and stakeholders.

Main lessons learnt regarding management

Programme management requires a long term vision and the ability to respond to changing circumstances. The example of biopesticides in the vegetable cluster is fascinating as in 1995 there was not an appropriate environment for working with the private sector (e.g. lack of consumer/ legislative pressure). Conversely it was not realised how complicated quality control and knowledge management issues would be when attempting to produce biopesticides at a smallholder level. Through maintaining a vision but not sticking to a template the CPP is on the threshold of facilitating major success in the adoption of this pest control method which will achieve subsequent environmental and human health benefits (as well as macro-economic impacts for the Kenyan economy). We had various discussions as to the ideal project length and nature of project commissioning but we feel that it is vital that whatever process is used it is possible to be flexible (in both a proactive and reactive manner).

There was general satisfaction with programme commissioning and management processes. It is possible that a couple of important areas of research were overlooked at the beginning of the strategy because the organisations involved in the research did

not have expertise in these areas. Through raising awareness of the CPP the programme was able to access more varied expertise and so become more demand driven. Many respondents noted that they received high quality support from CPP management. It was noted that greater programme oversight and flexibility from DFID may have enabled changes to be made mid-stream in projects that were poorly implemented to save time and funds. Sound M&E systems as integral parts of research programmes and projects would enable appropriate changes to be made in a timely way in future. Concerns were raised about the administrative burden and excessive amounts of paperwork involved especially from approved concept note to project memorandum. The lack of appropriate skills on the PAC e.g. no representatives from the private sector and no developing country crop protection practitioners was also highlighted. These lessons should be further considered by DFID, programme management and the evaluation team in terms of their inputs into a new research strategy post 2006.

It was felt that using Intellectual Property (IP) experts would bring a level of transparency that would alleviate concerns over bio-piracy. The reviewers also feel that communication within the cluster has weakened over the past couple of years and any future strategy should put in place a system for project co-ordination and inter-project communication.

DFID (CRD) should not neglect supporting further generation of new knowledge in the new research strategy as long-term progress cannot be made without continued research. When the objective of research is placed in the context of contributing to reducing poverty, enhancing livelihoods and benefiting the environment even researchers have to carefully consider where their capability and knowledge is best targeted. Although many would deplore the “quick-fix” approach, if adapting existing technologies to developing country problems can have greater impact in the short-term – an approach often used by the private sector, then such approaches cannot be ignored.

Future trends and opportunities

The horticulture sector – both domestic and export - in Kenya will continue to grow. Most promising domestic crops include tomato, traditional leafy vegetables including kale, chillies, fruits including passion fruit for fresh fruit and juice, mangoes, avocados and nuts, overwhelming grown by small-holders. All of these crops have serious pest and disease problems that will benefit from further research and/or transfer of crop protection technologies developed elsewhere.

In the first 8 months of 2004, horticultural exports from Kenya increased by 22%. However, the export sector is facing increasing competition from other countries based on quality issues and freight costs. At the same time, EUREPGAP is seen as an opportunity for Kenya to retain its market share (as other countries fail to meet strict regulations) and for the sector to become more professionalized. It is likely that EUREPGAP compliance should give Kenya a competitive advantage over other developing country horticultural-exporting nations.

Kenya will need to diversify its crop base to remain competitive (current reliance on French bean, roses and avocados is not sustainable). Areas of diversification include: spice production which can be transported by sea and/or seeking new markets e.g.

Middle East, Asia etc. Flower production will continue to grow as Kenya is very competitive. There is also opportunity to exploit Kenya's comparative advantage in avocado production. Both spices and avocado are largely small-holder crops and the base of small-holders involved in flower production is increasing.

It is therefore important that the sector continues to have research back-up to address problems such as pests and diseases (as well as crop post harvest handling and marketing) that reduce product quality, production and value: key factors that will reduce Kenya's competitiveness and threaten the livelihoods of small-holders and employees in the export and domestic sectors. In addition, to remain competitive, the export sector should concentrate on: labour rather than capital intensive systems; perennials to reduce overall costs of production; high value/unit area crops e.g. fruit and flowers; less perishable commodities which opens up the possibility of sea transport; establishing good market information systems; and diversifying cropping systems.

The CPP vegetable cluster projects, together with other initiatives to manage pests and diseases in the horticulture sector in Kenya, have made a substantial contribution during the RNRRS 10 yr strategy. There are still many crop protection problems to be solved and thus demand-led future opportunities for crop protection research. These include:
development of systems-level IPM strategies resulting in overall improvement in system-level product quality and safety to the benefit of both export and domestic vegetables; development of area-based IPM systems; development of affordable BCAs and delivery and application systems for small-holders; and research on management of pests and diseases of new crops including development of BCAs for other important pests and diseases to retain small-holders in the sector. As the evolution of the vegetable cluster and the more recently commissioned CPP projects have shown, the best way to do this will be through public-private sector partnerships.

It will be essential to link future research on pest and disease management to efforts in breeding improved varieties of vegetables for resistance/tolerance to major diseases and pests and to efforts to improve seed systems and seed legislation in target countries, to the benefit of the horticulture sector as a whole.

1. Background

The management team of DFID'S Crop Protection Programme (CPP) requires assessment of and reflection on achievements and management processes. During the winter of 2004/2005 the whole of DFID's RNRRS is being evaluated. Due to the enormity of the task it is unlikely to be able to draw out lessons from the unique CPP thematic cluster strategy. Therefore a lesson learning activity for one of the CPP's thematic clusters – the vegetable cluster in East Africa - will augment and feed into the RNRRS evaluation, provide important lessons for the final year of the programme, and guide future research strategy.

The vegetable crop protection projects were the first to be organised into an effective cluster in 1997/8. It was thoroughly reviewed in 1998/9 (Lenné 1999), revised and improved. It was reviewed again in 2002/2003 (Lenné 2002; Ota and Lenné 2003; Dobson and Cooper, 2003) and further revised and improved as it moved into a predominantly promotional phase. These reviews demonstrate substantial monitoring and evaluation input at critical stages leading to strategic decisions, changes in direction and in partner institutions (Figure 1). On the basis of programme development research the CPP decided to engage with the private (as well as the public) sector for the promotion of research outputs in this cluster. The extent to which this has occurred is unique within the programme and is still novel amongst other agricultural research programmes. The cluster has been founded on thorough and well-grounded demand-led research and this study will demonstrate that it has had influence on policy in Kenya and has effectively promoted outputs and stimulated uptake.

This lesson learning study considers cluster and programme-level issues as well as lessons learnt from specific projects.

Overall objectives

- Identify how outputs from the CPP vegetable cluster have contributed to the needs of major stakeholders in the horticulture sector in Kenya.
- Describe strategy, impact and management lessons learnt in terms of private sector engagement (vis-à-vis engagement with the public sector) in horticulture in Kenya.

In addition, the study analyses trends in the horticulture sector in Kenya as a guide for future research strategy and opportunities.

1.1 Process

This study of the most important lessons learnt from the vegetable cluster projects implemented mainly in East Africa during the ten year period of the RNRRS (1995-2005) comprised two main activities: firstly, responses were sought to a questionnaire sent to leaders, managers, advisors or collaborators on at least one project during the period (The questionnaire is given in Annex 1) and secondly, feedback was sought directly from major stakeholders in the horticulture sector during a one week visit to Kenya (Annex 6). The study team compiled 15 responses to the questionnaire, incorporated the feedback from major stakeholders in Kenya, synthesized the information, and identified important lessons organized under Impact, Strategy and Management.

The questionnaire; schedule for Kenya visit; list of respondents to the questionnaire and key stakeholders contacted in Kenya; main outputs of past projects; achievements and contributions of current CPP projects in the vegetable cluster; current activities, plans and issues raised by key stakeholders in Kenya; and documents consulted are included in Annexes 1-7.

1.2 The horticulture sector in Kenya

Horticultural crops – both for local consumption and export – are important crops in Kenya, recognized for their health and nutritional benefits and cash income. The total area under horticultural crops is estimated at 245,920 ha of which approximately 100,000 ha is under vegetable production (HCDA 2002). And, according to HCDA and HDC, the horticulture sector – both domestic and export – is continuing to grow. In 2000, Kenya produced over 1 million tonnes of vegetables of which 90% was consumed domestically and 10% exported (HCDA 2001). Vegetables are the most important component of domestic horticulture, contributing 60% to the market, and make up almost 50% of the volume of exports.

However, production of vegetables in Kenya, especially for the domestic market, is still limited by major pest and disease constraints, excess use of inappropriate pesticides, lack of improved varieties, and lack of and access to improved technologies to address these major constraints. These constraints result in the level of production being well under its potential. CPP's efforts over the past 10 years have made a significant contribution to addressing these major constraints, however continued research input in and development support for the horticultural sector in Kenya is overwhelmingly justified.

The Kenya Policy Paper on the Horticultural Industry demonstrates strong commitment to accelerating the growth of horticultural production to improve food security, earn foreign exchange, generate employment and income, alleviate poverty and enhance development in arid and semi-arid areas. With regard to vegetable production, the government aims to increase production of quality vegetables, diversify varieties, improve post-harvest technology, register nurseries for seedlings, and set quality standards for the domestic market. The policy environment in Kenya is therefore conducive to initiatives to support development of the horticultural sector.

1.3 Importance of a viable horticulture sector to reducing poverty in Kenya

Horticulture is the fastest growing agricultural sub-sector in Kenya contributing almost 13% to GDP. Horticulture, whether for the domestic or for the export market, is a major employer in the agricultural sector with at least 2 million employees earning all or part of their income from horticulture. A significant number are semi-skilled or unskilled Kenyans who would struggle to find alternative employment today with unemployment levels around 40%. It is estimated that 50,000 small-holders grow horticultural crops for the export sector each having an average of 5 dependents. A considerable number of Kenyans therefore rely on the horticulture sector for their livelihoods.

Recent case studies of households involved in the export horticulture sector (small-holder out-growers, farm employees and pack-house workers) and the domestic sector (small-holders selling to Nairobi markets) have clearly shown that households

involved in the horticulture sector are substantially better off for income generation than those households not involved in horticultural production (Oruko and Ndungu 2001; Minot and Ngigi 2003). In the case of small-holders, average annual household income and adult equivalent income are significantly higher – as much as five times higher for small-holders growing for the export sector. For employees on exporters' farms, the mean adult equivalent income was 30% higher and most rural migrant workers sent remittances home. For pack-house workers (mostly young, unskilled females), their average wage was considerably above the minimum wage for unskilled workers and most rural migrants sent remittances home. Further growth of the horticulture sector in Kenya – both export and domestic – is likely to contribute further to reducing poverty and improving livelihoods by increasing employment opportunities and increasing incomes of small-holders and employees and will be beneficial to further growth of the Kenyan economy.

1.4 The history of the Crop Protection Programme's Vegetable Cluster

The current portfolio of projects in the vegetable cluster of the Crop Protection Programme (CPP), and, indeed, aspects of the enabling environment are the consequence of the CPP's strategic decisions since its inception in 1995. Below is a brief overview of the history of the vegetable cluster which puts the strategic decisions and directional changes in their programmatic context. This is illustrated by the 10 year vision framework for the cluster (Figure 1).

The CPP's initial strategy for vegetable projects was laid out in the 1994 Renewable Natural Resources Research Strategy (RNRRS) (also termed the 'Yellow Brick'). There was a significant (75%) allocation of resources in the first year from the previous Integrated Pest Management Strategy Area (IPMSA). The initial strategy of the CPP was therefore strongly influenced by inherited projects. Attempts were also made to align CPP vegetable projects in Kenya and Ghana with bilateral development projects.

In 1996, the CPP commissioned its first tranche of research projects addressing various aspects of management of major pests of vegetable crops in East Africa. Under the RNRRS vegetable cropping systems were placed in the 'High Potential' and 'Peri-Urban' production systems. Outputs for these production systems were very specific. The emphasis, particularly in the Peri-Urban production system, was on the development of pest management methodologies. The target institutions were National Agricultural Research and Extension Systems (NARES), private sector agricultural industries and international research centres.

In 1997 DFID published its White Paper on 'Eliminating World Poverty'. The CPP commissioned an Output to Purpose Review of the CPP strategy (completed in January 1998). This had a significant influence on the strategy of the programme. As a consequence the CPP sought to improve the co-ordination and focus of its project activities, targeting fewer countries and fewer crops. Consequently, all African vegetable projects were brought together under the Peri-Urban production system and concentrated in Kenya; taking the identity of the vegetable thematic cluster. In 1999 the vegetable cluster was the first to develop its own strategy through meetings of project leaders and key collaborators and the co-ordination of research activities.

Efficiencies were achieved and a comprehensive socio-economic study was conducted which has been able to guide all of the projects in the strategy to this day[1].

In 1998 a programme development study was conducted to review the progress of the projects commissioned in 1996 in the context of other current and planned activities within the Peri-Urban production system. In the broader agricultural development context, the impact of vegetable research towards the livelihoods of the poor still received a low profile. The study recommended the continuation of activities that would produce outputs with clear benefits for small-scale farmers producing kales, cabbages and tomatoes for local consumption. For team work efficiency, it advised against creating a single mega-project. Instead a number of discrete but well-coordinated follow-on projects were commissioned in 1999. Also at this time efforts were made to identify further partners who could contribute to the vegetable cluster. The results of these efforts were initiation of projects led by HRI (1999), the private company Dudutech (2002), and ICIPE (2003) and the involvement of a broader range of collaborators engaged in the current vegetable projects.

In 1999 the management of the CPP was re-tendered and won by NR International. During this process in accordance with DFID's wishes the Production System Logframes were adapted so the previous multiple project outputs were reduced to two: one for the generation of pest management strategies and one for the promotion of these strategies. This represented a significant shift for the programme and placed a heavy emphasis on the funding of adaptive research and the promotion of research outputs, which had not been envisaged at the beginning of the strategy in 1995. The CPP revised its strategy but with the vegetable cluster portfolio fully funded with three year projects, there was an inevitable lag in implementing major strategy changes in the cluster.

In 2000 the results of a number of studies into the factors affecting the uptake and adoption of research outputs and understanding farmer decision-making processes were brought together in a major CPP workshop entitled 'Sustaining Change'. The CPP programme management realised that they would need to evaluate a range of promotional pathways before contracting further projects in the vegetable cluster. Towards the end of 2000, DFID published its white paper on 'Making globalisation work for the poor'.

In 2002 a programme development study entitled 'Promotional opportunities for outputs from the CPP Peri-Urban African vegetable cluster projects' was commissioned. The primary objectives of this study were to a) identify outputs from the African Vegetable Cluster projects for which demand had been registered by stakeholders and beneficiaries and that had the best chance of being taken up partners and used by farmers; b) identify potential partners for promotional activities and pathways; and c) integrate and expand the existing promotional strategy to maximize uptake and potential impact of cluster outputs as a contribution to the Peri-Urban Production System Purpose. There was a strong recommendation for the CPP to engage with the private sector for the promotion of project outputs. This led to an

[1] **Oruko, L and Ndungu, J (2001) Final socio-economic report for the Peri-urban vegetable IPM thematic cluster. (report for CPP)**

open call for proposals of a promotional nature towards the end of 2002 for which the CPP received an excellent response of high quality proposals.

Realising that collaborating with the private sector was a potential minefield; the CPP assessed the need for a study on the impact of promotion through the private sector on the livelihoods of the poor. In doing so, it was discovered that DFID was funding two projects that partially addressed this area. The CPP therefore waited for these studies to report before commissioning a further study to fill in information gaps. This study reported in 2003 (Ota and Lenne, 2003) and showed clearly that there would be strong advantages to promoting through the private sector and the disadvantages would be small or unlikely.

Through working with the private sector the CPP was confident that it had found a pathway to promote biopesticides in Kenya. There was also a need to make biopesticides available to farmers which would require registration. As the law stood, biopesticides would need to be registered under the same complex procedures as a synthetic pesticide. This was considered to be a costly, time consuming and a rather inappropriate approach. Therefore, early in 2003, the CPP provided funding for the planning, facilitation and implementation of a workshop in Kenya to draft revised legislation for the registration of biopesticides (microbials, natural enemies and botanical pesticides). The workshop was a great success with the head of the Kenya Agricultural Research Institute (KARI), Dr Kiome, giving his full support to the initiative. The net result was a Legal Notice which will become law as soon as parliamentary time permits. This legislation is superior to that of the UK and looks likely to become a model for many other African countries.

In 2004 the Crop Protection Programme was informed that it would be extended until 2006. This current study is the first review to consider the lessons learnt from the vegetable cluster during the lifetime of the CPP.

2. Lessons learnt from the Vegetable Cluster in East Africa

The most important lessons learnt from the vegetable cluster projects implemented mainly in East Africa during the ten year period of the RNRRS (1995-2005) were identified through a questionnaire sent to 15 persons who were/are leaders, advisors or collaborators on at least one project during the period and through discussions with major stakeholders in the horticulture sector in Kenya. The study team compiled the responses to the questionnaire, incorporated the feedback from major stakeholders in Kenya, synthesized the information, and identified the following important lessons organized under Impact, Strategy and Management. It is expected that this report on lessons learnt from the vegetable cluster projects will refine the direction of project activities planned during the final year of the CPP, feed into the RNRRS evaluation, and guide future research strategy.

2.1 Lessons learnt regarding impact

The cluster of vegetable projects in Kenya is considered to be one of the most effective clusters in the CPP for contributing to reduction of poverty and improvement in livelihoods of poor small-holders working in both the domestic and export sectors and poor employees working in the export sector (see above section). Efforts by CPP projects have contributed to the accumulated benefits from a range of donor projects and the industry inputs.

Most respondents and stakeholders in Kenya agreed that the most important outputs and achievements from the vegetable cluster projects were:

- the successful development and promotion of biological control agents (fundamental to a research programme that was founded on the philosophy of reducing the use of harmful pesticides to the benefit of the poor);
- capacity building within the public research sector especially in KARI and CABI in Kenya; capacity building within the private sector especially through R8297 Private sector service providers; and capacity building of farmers involved in most projects;
- the facilitation of policy changes through the development of pioneering biopesticides legislation to ensure that the products of at least ten years of research would be promoted and used - the fact that Legal Notices are now in place a year after the CPP-funded Biopesticides Registration Workshop is considered to be a remarkable achievement of the CPP by Kenyan stakeholders;
- the development and wide promotion of attractive and effective promotional tools such as the handbooks on integrated vegetable pest management, accompanying posters and two calendars (illustrated by the Nation's cartoonists) which were originally developed by R6764 in Zimbabwe: there has been great demand for these outputs which have been subsequently used by a number of CPP projects (e.g. R8297 Private sector service providers and R8341 Promoting IPM in vegetables in Uganda) and by other donors e.g. FAO FFS;
- The development of successful and effective public-private sector partnerships through R8297, R8217 and R8218. In addition, it is likely that R8312 Production of quality kale seed will also develop an effective public-private sector partnership by 2005.

It was also noted that these outputs and other outputs are being and will continue to be used long after the lifetime of the CPP. This strongly suggests that the major achievements, impact and influence of the CPP will probably not be realized until the medium-term future which we wish to emphasize to the evaluation team and DFID.

There are advantages in smoothly achieving objectives and moving forward to impact for Kenyan-based project leaders in project implementation, partnership development and stakeholder contacts. The advantages were highlighted by projects led by ICIPE and Dudutech while the disadvantages of leading projects from a UK-base were emphasized by NRI and the University of Reading. In addition the former programme manager noted the disadvantages of not having project leaders based in Kenya. Future projects should give some consideration to basing project leaders and/or the cluster coordinator in country. However, the UK science base have provided an invaluable and unique expertise resource throughout the CPP strategy which still has a lot to offer future vegetable research in Kenya.

The lack of linkages, especially for promotional activities, between the CPP (in spite of consistent attempts by programme management to build such links) and the DFID in-country advisers and programmes in Kenya was considered to have hindered promotion and reduced the impact achieved by the vegetable projects in Kenya during

their lifetimes. One notable exception is the recent strong linkage formed between R8297 Private Sector service providers project and the DFID Business Services Market Development Project (BSMDP) - a rare example of a productive linkage between the DFID in-country programme and a DFID research programme. The contribution from the BSMDP has added value to the CPP project. The experience has also been a valuable and reproducible two-way learning process which should be a model for future DFID projects. More importantly, the concept of private sector providers has now been taken up by other groups/donors which are training trainers and/or farmers to meet the EUREPGAP traceability regulations. These include: HDC, PIP, Real IPM, HCDA, Pride Africa, CARE REAP etc. Thus R8297 has stimulated/enabled other donors to provide more sustainable training input into the export horticulture sector in Kenya to ensure that as many small-holder out-growers as possible can remain in the sector – thus ensuring on-going contributions to reducing poverty and improving livelihoods.

It was also noted that achievements could have been greater if a local forum for information sharing had been established in Kenya to further build awareness and promotion potential. Achievements could also have been greater if researchers had been aware of the strong emphasis to be placed on promotion of outputs during 2002-2005 and the necessary uptake pathways to ultimate beneficiaries built into early projects. However, it was not until 1998/9, that DFID clarified that its expectations regarding promotion of outputs to ultimate and not only intermediate beneficiaries (the latter was understood by programme managers in 1995). CPP has coped well with this sudden change in DFID strategy in 1998/9 in the vegetable cluster projects and successfully promoted outputs to both intermediate and ultimate beneficiaries.

A number of respondents noted that CPP has been part of a broader effort to reduce pesticide use in vegetable production systems. Although this is currently more advanced in the export sub-sector where strict quality regulations (e.g. MRLs) dictate pesticide application regimes, there is also growing awareness in the domestic sub-sector regarding quality issues e.g. by the supermarkets, especially. Most importantly, many farmers growing vegetables for both the export and domestic sub-sectors are practising export quality standards at farming system level to achieve traceability compliance, to the benefit of vegetables grown for the domestic sector. It is only a matter of time before reduced pesticide use and greater use of non-chemical methods including biopesticides are more widely adopted across the entire horticulture sector. CPP has played an important role in contributing to these growing spill-over effects.

The development of improved agricultural practices at systems-level opens up the possibility of building awareness among domestic consumers that vegetables from small-holders working in the export sector are higher quality and safer (with minimal pesticide residues) than those grown by small-holders only growing non-export vegetables. If such vegetables commanded a price premium in the market, this would provide incentive for other small-holder growers to adopt good agricultural practices for producing higher quality vegetables. This should be discussed further with supermarkets and other stakeholders e.g. HCDA.

R8297 has shown that small-holder out-growers for the export sector can adopt traceability systems and sound IPM and agricultural practices required under EUREPGAP and can be certified. Export companies are therefore likely to retain their

small-holder out-grower bases (and perhaps even increase the numbers) as continued involvement of a geographically diverse small-holder base is a) less costly and b) less risky. Therefore, in contributing to the retention of small-holders out-growers in the export sector, R8297 has directly contributed to reducing poverty amongst these farm families and their employees. It was noted by Rod Evans of Homegrown: "*export companies would not spend so much time building capacity of small-holders if they were not so committed to their retention as out-growers"*.

In general, respondents highlighted cluster achievements that were more likely to sustain on-going positive change in the horticultural sector.

2.2 Lesson learning regarding strategy

The vegetable projects in East Africa were the first CPP projects to be organized into a cluster in 1997/98. Several respondents emphasized the value of cluster structure and cluster meetings for keeping well-informed. Others noted that the value of clusters could be further improved by enhanced interactive planning across the cluster and greater information exchange across projects. Those project leaders and collaborators who joined the cluster later e.g. from ICIPE and Dudutech were less informed of the previous projects implemented and the development of the cluster. This suggests that need for a briefing by management or the cluster coordinator and appropriate tools to appraise new members.

The transition from development of technologies or research outputs to promoting research outputs in 2002 was considered to be abrupt and, in some cases, disruptive. In addition, two respondents from the public sector (based in Kenya) felt that the decision to promote biological control agents through the private sector was not handled as well as it could have been (e.g. two Kenyan-based public sector respondents noted that the CPP could have facilitated the building of trust with the private sector prior to the transition). Most respondents and stakeholders in Kenya, however, considered this rapid transition to be necessary in order to achieve uptake. Several contributors – both from the public and private sectors - emphasized the need to build promotional "mentality" and engage with "promotional" stakeholders from the beginning of the research strategy.

One respondent noted that in the process of implementing promotional activities, new researchable issues and areas can be identified for future research effort.

Most respondents and stakeholders in Kenya highlighted the need to use ALL relevant and available means for promotion of outputs – public, private, NGO etc. – as has been done in the vegetable cluster projects. The choice will depend on the technology, the situation, the country etc. The importance of involving promotional partners and stakeholders in the research process itself to gain ownership of the outputs was emphasized.

Most respondents and Kenyan stakeholders highlighted the critical importance of working with the private sector once decisions were made by CPP management to a) give priority to developing biological control agents into biopesticides and b) use the export sector as a promotional pathway for outputs. Both research and commercial sector respondents noted that without a private sector partner, promotion of biocontrol agents developed by the CPP projects would have been near impossible.

Several contributors noted that the private sector should have been involved earlier in the vegetable cluster projects. DFID was considered to be slower and more timid than other donors to engage with the private sector in Kenya. It was felt that two much emphasis was given to reducing poverty at the individual small-holder household level (livelihoods philosophy) and not enough to contributing to poverty reduction in the horticulture sector as a whole e.g. through employment as well as small-holders. CPP was convinced of the opportunities for reducing poverty by working with the export vegetable sector in 2001/2002. DFID is now more aware.

CPP's small investment in the original biological control company in Kenya – Dudutech – and in facilitating the development of important and pioneering biopesticides legislation with successful outcomes has clearly contributed to growth in interest and activities in biological control in the horticulture sector. A new company - Real IPM - has been established and several export horticulture companies are mass-producing natural enemies. In addition, several South African companies are testing biopesticides in Kenya with a view to registration and sale. Respondents from the commercial sector in Kenya strongly recommended the need for on-going research on identification and development of biological control agents of key pests and pathogens of important horticultural crops in Kenya (and elsewhere).

Respondents replied somewhat inconclusively to the question: whether the CPP was funding an appropriate balance among public, private and NGO promotional pathways. Again most noted that funding should be allocated to the most "appropriate" promotional pathway for the output and considered the current balance would contribute to achievement of key outputs. Several respondents stressed that collaborators should not be included for "political correctness, protectionism or based on perceived development models". It was also stressed that awareness needs to be raised further among some stakeholders of the unique role and contribution of the private sector in commercialising biopesticides and mass production of biocontrol agents. It would be impossible for the public sector in Kenya to achieve this with current infra-structure and skills.

No one could doubt that one of the most important achievements of the CPP vegetable cluster projects is the development of effective biological control agents into commercial products to the benefit of the horticulture sector as a whole. Sustainable promotion would have been impossible without the involvement of Dudutech. The CPP support for Dudutech enabled the transformation of research into reality. The strategy was sound and the right choice was made. However, the priority now is to develop delivery and application systems so that these products can contribute to the improvement in the livelihoods of small-holders across the horticulture sector.

The strategic decision made in 1998/9 to centralize most activities in East Africa, especially Kenya, was considered essential in ensuring maximum achievement with available resources. At the same time there was general agreement among respondents that the lessons learnt from the vegetable cluster model in Kenya would be applicable to other African countries with important vegetable sectors e.g. Ghana, Zambia, Zimbabwe etc.

There was agreement among stakeholders in Kenya that the development of a horticulture network in East and Central Africa would be useful for coordinating the diverse and numerous research efforts and stakeholders. However it was recommended that the network should focus on one sub-sector such as vegetables as a horticulture network would be too broad and difficult to manage. It would be useful to learn from recent networks set-up under ASARECA e.g. for coffee, sorghum and millet etc. as teething problems (now resolved) delayed the development of the new networks.

2.3 Lessons learnt regarding project management

Some respondents and Kenyan stakeholders indicated the need for more of a "private sector" approach in developing strategy and management of projects. Even though some projects performed below average during the first six years of the RNRRS, none of the vegetable projects were terminated during their lifetime. Areas of work were terminated only after strategic programme development studies in 1998/9 and 2002/3. Greater programme oversight and flexibility from DFID may have enabled changes to be made mid-stream in projects if necessary, to save time and funds. The response from the former programme manager echoes this feedback: some projects were well-conceived but poorly implemented. This suggests that management should look at alternative improved ways to administer and oversee in-country activities rather than relying on specific individuals with institutional biases.

One respondent suggested that 3 yr projects for developing IPM systems in small-holder vegetable production systems are not realistic: there is need for a 10 year vision and flexibility to bring in additional partners as need arises. Longer project cycles e.g. 5 yr would enable more to be accomplished.

Project teams spoke very highly of South-South linkages. CPP funded projects have established linkages between Kenyan researchers and researchers in Zimbabwe, Ghana, Benin and Cuba. The researchers feel that these exchanges have opened their minds to new knowledge and new ways of doing things. Dudutech have already taken this forward by funding a researcher from Cuba to provide them with advice on standard operating procedures.

2.4 Lessons learnt regarding programme management

Programme management requires a long term vision and the ability to respond to changing circumstances. The example of biopesticides in the vegetable cluster is fascinating as in 1995 there was not an appropriate environment for working with the private sector (e.g. lack of consumer/ legislative pressure). Conversely it was not realised how complicated quality control and knowledge management issues would be when attempting to produce biopesticides at a smallholder level. Through maintaining a vision but not sticking to a template the CPP is on the threshold of facilitating major success in the adoption of this pest control method which will achieve subsequent environmental and human health benefits (as well as macro-economic impacts for the Kenyan economy).

There was general satisfaction with programme commissioning and management processes. Many respondents noted that they received high quality support from CPP management. Concerns were raised about the administrative burden and excessive amounts of paperwork involved especially from approved concept note to project

memorandum. It was felt that projects would be better co-ordinated if the programme released funds for a stakeholder planning workshop to develop a project memorandum for teams whose concept note had been accepted.

It was felt that programme level M&E systems were sufficient for the monitoring of activities and financial spend. Project M&E strategies and the ability to consider the impact of projects on poverty varied. Sound M&E systems as integral parts of research programmes and projects would enable appropriate changes to be made in a timely way in future. If programmes were able to commission post project impact assessments

The lack of appropriate skills on the PAC e.g. no representatives from the private sector and no developing country crop protection practitioners was also highlighted. These lessons should be further considered by DFID, programme management and the evaluation team in terms of their inputs into a new research strategy post 2006.

It was felt that using Intellectual Property (IP) experts would bring a level of transparency that would alleviate concerns over bio-piracy. The reviewers also feel that communication within the cluster has weakened over the past couple of years. An example of this arose on the IP front where those concerned with the original collection of biopesticide isolates felt that there should be some benefit or acknowledgement given to the communities or individuals from where the isolates originated. They did not seem to be aware that Dudutech are now using isolates they have collected by themselves. Fears over IP should be relatively simple to assuage.

There does seem to be a contrast in opinion between public and private sector regarding IPR. Since the late 1980's there has been focus on the IPR developed from research as being the most commercial aspect. This is not true for biological control agents used in agriculture and horticulture, where IPR protection is usually not possible (unless considering the gene technology). It is common for commercial producers to produce other companies' isolates. Many researchers perceive that they own their isolates, this is not the case and they cannot protect them. The value is in the scientific knowledge the researcher has as this saves companies time and money. There is a large gap between what researchers or institute considers a commercially interesting isolate and what a commercial company considers.

There is often a muddling up between IPR protection for isolates and the principles of the Rio Biodiversity Convention and protection of a countries natural resources. There is particular confusion in situations where the isolates are to be produced and used in the country of origin or perhaps produced in a country then exported. The biodiversity convention is not really applicable in these cases.

One respondent noted that in the future research strategy, DFID should not neglect supporting further generation of new knowledge as long-term progress cannot be made without continued research. When the objective of research is placed in the context of contributing to reducing poverty, enhancing livelihoods and benefiting the environment even researchers have to carefully consider where their capability and knowledge is best targeted. Although many would deplore the "quick-fix" approach, if adapting existing technologies to developing country problems can have greater

impact in the short-term – an approach often used by the private sector, then such approaches cannot be ignored.

3.1 Achievements and contributions of CPP Vegetable Cluster projects to the horticultural sector in East Africa

Issues in the vegetable sector in Kenya, both domestic and export, are multi-faceted in nature. CPP funded research projects have worked hard to address pest management constraints, the main outputs of past projects are listed in Annex 4 and the main achievements of the current projects are described in Annex 5. The achievements of the vegetable cluster can be divided into three main (and overlapping) areas: biopesticides, knowledge generation and promotion and spill-overs.

3.1.1 *Biopesticides*

Since 1995 CPP funded projects have focussed upon the identification of biopesticides for the management of two key pests, namely, diamond back moth (DBM) (*Plutella xylostella*) and Root Knot Nematode (RKN). These are major pests for smallholder producers farming for household or domestic consumption. RKN is also a major pest for export horticulture crops.

Two research approaches were used in the management of DBM. Firstly, the opportunity to use pheromones to cause mating disruption was investigated until 1999 when it was decided that the results were not sufficiently promising and the research was dropped. Secondly the use of an endemic baculovirus (PlxyGV) to act as a biopesticide in DBM control was shown to have a high efficacy in DBM management and current research is concentrated on production and delivery of this agent.

Two approaches were also investigated into the control of RKN through the use of two biological control agents, the fungus *Pochonia chlamydosporia* and the bacterium *Pasteuria penetrans*. These have both proved to be effective. *P. chlamydosporia* will be tested on farm in early 2005 and *P. penetrans* is likely to be field-tested soon after.

The CPP management recognised that simply funding research into biopesticides would not be enough to make them available to Kenyan farmers. Appropriate registration procedures that were recognised by Kenyan law would enable products to be marketed and made available to farmers throughout the country. Therefore CPP funded the planning and facilitation of a workshop on 'Registration for biocontrol agents in Kenya' held 14-16th May 2003. The net output of this workshop was a legal notice which will pass into national legislation once there is parliamentary time. The registration procedures are cheaper, faster and more appropriate for biopesticide registration than those developed for synthetic pesticides. This was a major achievement which has radically altered the future in Kenya in terms of in terms of the production, sale and use of biocontrol agents.

3.1.2 *Knowledge generation/knowledge promotion*

CPP management does not believe that there is a single solution to pest problems. Throughout their strategy, the CPP has advocated integrated approaches. Management feels that it is imperative for sustainable pest management to empower farmers with a wide range of pest management options.

For example, rather than rely only on biological control agents, RKN management research has also investigated the use of resistant tomato varieties and agronomic practices. The IPM projects have focussed on combining non-chemical techniques with pesticides. These have been captured in the 'Vegetable Pest Management' and the 'Farmers Friends' manuals and the 'Winding Road' poster. An interesting point was made that some farmers prefer such information to be provided in English (rather than Swahili) for linguistic accuracy in describing technical issues.

Smallholder participation in the Kenya horticultural production is threatened by lack of efficient extension services. The CPP has funded projects with diverse approaches to the promotion of crop protection knowledge. Through this diversity the study team considered that the CPP was successfully targeting different congregations within the horticulture sector in Kenya.

Project R8299 links with IFAD funded farmer field schools to provide inputs on vegetable cultivation to 5000 smallholder farmers in Western Kenya. As the project has had to respond to farmer demand, it has addressed far more issues than vegetable crops but disease management on kale is one of the key agricultural constraints. Also in working with farmers producing for local markets, R8312 is looking to improve seed supply of superior kale varieties. Its activities will be scaled out through community groups and possibly through the private sector.

3.1.3 *Links with the private sector*

Small-holder farmers producing for the private sector have benefited from R8297: an innovative promotional project which has trained and supported a group of individuals operating as private sector service providers to train farmers in improved pest management and bring farmer groups to a level at which they can achieve the EUREPGAP standard. Several key individuals in the horticulture sector spoke of the problems of myth and mis-information concerning the EUREPGAP standard. It is widely recognised that the service providers trained through this project have brought a truthful and valuable service to the farmers. Their charge rates have been at a level that, unlike other trainers, some farmers can afford to hire them. In addition to the agricultural knowledge provided their ability to conduct training on group dynamics and business marketing mean that they offer a holistic approach to the issues facing smallholder export farmers. All of the graduates from this training course have set themselves up as businesses whereby they are fulfilling a unique niche in the export farmer training sphere. This well-respected business is already being contracted by several international donor funded projects.

Dudutech, who have been leading two projects on developing biopesticides against RKN and DBM (R8217, R8218), will in the coming year commence commercial level production. This will bring direct benefits to the farmers and farm labourers working on farms belonging to Homegrown and their subsidiaries. Once these products have proved themselves they will be made more available through both internal and external marketing.

Although not the first donor to work with the private sector and although not without its problems, the CPP should consider the links it has made with the private sector in Kenya through several projects in the vegetable cluster as a major achievement. These effective links with the private sector have resulted in projects achieving or over-

achieving their objectives. As management has maintained good contact with the private sector, CPP has remained aware of on-going changes in this very dynamic sector. The links have been recognised by other donor initiatives e.g. the DFID-funded Business Services Market Development Project (BSMDP) has provided additional funding to R8297 Development of Private Sector Service Providers to add-value to training in EUREPGAP requirements and business management. Trainees from this project have also been used by the USAID-funded HDC to train export company trainers.

3.1.4 *Dissemination outputs*

Project leaders have been incredibly creative in developing innovative promotional tools. Excellent examples include calendars made for 2002 and 2005 entitled 'Better practices for small-holder vegetable farmers' and 'Pest management for small-holder farmers', with illustrative cartoons provided by the popular cartoonist of the 'Daily Nation' newspaper. Demand for these calendars has been immense and recipients are always very grateful.

In addition flash cards with clear photographs of pests and natural enemies have been a boon for trainers to inform farmers about the organisms in an uncluttered manner. Many courses have been conducted both as components of CPP funded projects and through projects funded by others. Project leaders have appeared in radio and television programmes and have contributed to newspaper articles. Project leaders have been asked to contribute to a Kenyan television soap opera being developed for broadcast in 2005.

To the knowledge of the study team there has not been any assessment of the impact of these promotional tools: which tools have influenced peoples' behaviour, whether different social groups are more influenced by certain tools etc. It should also be noticed that with the high profile vegetable cropping (including pest management) has in the Kenyan media it is likely that tools may be more influential now than they were several years ago. We recommend to CPP management that some consideration be given to assessing the impact of these innovative promotional tools to inform future DFID research strategy.

3.1.5 *Seed systems*

It is widely recognised that improved seed is often the easiest new technology for a farmer to acquire. Until 2003 seed was only included as a component of other projects, not as the main focus in the vegetable cluster projects. However as a result of project R8312, seed and seed delivery systems have been shown to be of key importance to all sectors of horticulture production in Kenya. A comprehensive review will be found in the report of a study commissioned by CPP/DFID/Gatsby Charitable Foundation due in January 2005. It is considered that improving seed quality and seed systems could considerably improve both the livelihoods of the producers but also the nutrition of the consumers. Improvements would also result in greater impact from pest management technologies developed from the CPP vegetable cluster projects.

CPP also has experience in seed potato production systems in East Africa, initial research in Kenya has been transferred to Uganda with success in the development of community level disease free potato seed production units (project R8104).

3.1.6 *Spill-Over effects*

Dissemination outputs have circulated far beyond the original project target countries. The leader of R8341 commenting on the use of the 'Vegetable Pests Management' manual (originally developed in Zimbabwe through project R6764) stated that:

"There has been strong demand from other countries and regions for dissemination materials and training strategies produced to date as a result of Kenyan and Zimbabwean CPP-funded work. They have been distributed to over 30 developing countries and the associated training approaches have so far been implemented in Kenya, Zimbabwe, Zambia, Lesotho, Cameroon, Oman, Ghana and Uganda."

The large number of scientific papers (approximately 40 peer reviewed and 40 conference papers) shows that a large amount of information has been put in the public domain. In addition the number of degrees (approximately 8 PhDs, 3 MScs and 4 BScs have strengthened in-country capacity. This is likely to have led to significant spill-over effects from project outputs being applied in other locations and other cropping systems. Unfortunately, CPP does not have the resources to study impact as an indirect consequence of uptake of CPP funded research outputs by others.

It became clear from the study team's visit to Kenya that improved vegetable cropping practices are leading to improvements in farmers' other cropping systems and in farming systems as a whole. Service Providers trained through R8297 have identified both direct and indirect influences. Due to concerns over pesticide levels, farmers being trained to EUREPGAP standard are being taught that they have to consider pesticide applications used on crops grown in rotation with export crops, i.e. the chemicals used and the number of applications. To accommodate this farmers are having to conduct pest scouting at whole farm level and make decisions on chemical application.

Private sector biological control agents are likely to be exported out of Kenya. Dudutech mentioned that potential markets included: South Africa, Zimbabwe, South America and Scandinavia. Dudutech will soon not be the only company producing biological control agents e.g. Real IPM Company, Sunripe, VegPro, East African Growers are becoming involved. Project R7960 identified significant interest in the use of biopesticides in West Africa although there was insufficient capacity to produce them. It is therefore very likely that the achievements of the CPP biopesticide research will benefit farmers in other countries in addition to Kenya.

In summary the vegetable cluster can claim notable achievements but the magnitude of its achievements is only likely to be fully recognised in the medium term (5-10 years). This is based upon out-projections on the impact of the use of biopesticides, better knowledge provision systems and the probable benefits especially to local vegetable production through improved seed systems.

4.1 Future trends in the horticulture sector

Based on current growth trends, the horticulture sector – both domestic and export - in Kenya will continue to grow. Most promising domestic crops include tomato, potatoes, traditional leafy vegetables including kale, chillies, fruits including passion fruit for fresh fruit and juice, mangoes, avocados and nuts, overwhelming grown by

small-holders. All of these crops have serious pest and disease problems that will benefit from further research and/or transfer of crop protection technologies developed elsewhere.

In the first 8 months of 2004, horticultural exports from Kenya increased by 22%. If this trend continues, total earnings of small-holders from export horticulture will reach $36 million – an increase of $6 million over 2003. However, the Kenyan export sector is facing increasing competition from other countries based on quality issues and freight costs. For example, Morocco and Egypt are taking more of the European French bean export market from Kenya due to lower freight charges although there are doubts whether they can meet strict MRL standards. Kenya may have difficulty in competing with several countries for fruit quality e.g. passion fruit from Ecuador and mangoes from Asia. At the same time, EUREPGAP is seen as an opportunity for Kenya to retain its market share (as other countries fail to meet strict regulations) and for the sector to become more professionalized. It is likely that EUREPGAP compliance should give Kenya a competitive advantage over other developing country horticultural-exporting nations even if it results in some consolidation of exporters.

It is likely that Kenya will need to diversify its crop base to remain competitive (current reliance on French bean, roses and avocados is not sustainable), possibly moving into spice production e.g. ginger which can be transported by sea and/or seeking new markets e.g. Middle East, Asia etc. It is likely that flower production will continue to grow as Kenya is very competitive. There is also opportunity to exploit Kenya's comparative advantage in avocado production (produces tasty quality fruit compared to competitors such as Spain). Both spices and avocado are largely small-holder crops and the base of small-holders involved in flower production is increasing (Eryngium, Ammi Majus, Alstromeria, Moby Dick, Arabicum and Molucela are mostly by small-holders). The export and domestic small-holder sector is worth approx. $10 million annually and is growing.

It is therefore important that the sector continues to have research back-up to address problems such as pests and diseases (as well as crop post harvest handling and marketing) that reduce product quality, production and value: key factors that will reduce Kenya's competitiveness and threaten the livelihoods of small-holders and employees in the export and domestic sectors. In addition, some stakeholders feel that for Kenya to remain competitive in the export sector it should concentrate on: labour rather than capital intensive systems; perennials to reduce overall costs of production; high value/unit area crops e.g. fruit and flowers; less perishable commodities which opens up the possibility of sea transport; establishing good market information systems; and diversifying cropping systems.

4.2 Future opportunities for crop protection research

4.2.1 *Development of systems level IPM systems*

Development of sound IPM and good agricultural practices at the farming systems level resulting in overall improvement in system-level product quality and safety will benefit both export and domestic vegetables. However, integrating different technologies into a systems-wide approach requires a wide range of expertise; it is not a straightforward process. This will contribute to food safety and farmer safety, especially with regard to chemical usage, and lead to increased used of IPM methods

across the sector. With CPP's broad expertise of pest management on most crops grown by small-holders in East Africa, there is potential for integrating relevant outputs into systems-wide approaches. The complexity and the costs will need to be considered further. This is important as Kenyan consumers are becoming more aware of food safety issues. Safer, higher quality vegetables should command a price premium in the market which would act as further incentive for farmers to adopt system-level strategies.

4.2.2 *Development of area-based IPM systems*

BSMDP feels that the key to facilitating wider uptake of traceability regulations under EUREPGAP by the majority of small-holder out-growers will be to move towards area-based certification systems. This could also facilitate establishment of biological control programmes with natural enemies and biopesticides which may be difficult to establish on small areas normally cultivated by individual farmers. Research is needed on the feasibility of establishing such systems in the major horticultural production areas in Kenya associated with lessons learnt from establishing such systems elsewhere.

4.2.3 *Development of affordable BCAs and delivery and application systems for small-holders*

Doubts have been expressed by Dudutech and export companies on the ability of small-holders to successfully adopt complex biological control based pest management systems. Although it is expected that biopesticides and natural enemies will contribute to the improvement of livelihoods of poor farmers by improving crop productivity and quality, how to ensure that small-holders benefit from using biological control on their farms still remains to be resolved.

As recent capacity building efforts have shown, small-holder out-growers for the export sector can adopt traceability systems and sound IPM and agricultural practices required under EUREPGAP and can be certified. Export companies are therefore likely to retain their small-holder out-grower bases (and perhaps even increase the numbers) as continued involvement of a geographically diverse small-holder base is a) less costly and b) less risky. There does not appear to any major barrier to building capacity among small-holders to use management strategies based on biological control – although it might be costly and take time.

There is a need to identify decentralised facilities and infra-structure for area-level production, holding and distribution of biological control agents combined with services such as knowledge promotion strategies. One option might be to bring into operation the 10 HCDA collection depots located throughout the export horticulture production areas. There is an urgent need to develop affordable BCAs and delivery and application systems for small-holders. This is an area where donor support is needed through DFID and hopefully the EU PIP Small-holder Project with coordination from FPEAK.

4.2.4 *Research on management of pests and diseases of new crops*

As the sector diversifies into new crops (as noted above), further research will be needed to address pest and disease problems (as well as crop post harvest handling and marketing) that reduce product quality, production and value. These are key

factors that will reduce Kenya's competitiveness and threaten the livelihoods of small-holders and employees in the export and domestic sectors.

4.2.5 *Research on development of BCAs for other important pests and diseases*

Use of biopesticides and natural enemies will become more common in the export sector in future especially for protected crops. Biological control agents (BCAs) and natural enemies already identified and proven to control major pests will be increasingly used and new products will be needed as expected further restrictions on the use of chemicals are imposed. Additional training will be needed on the use of BCAs. Awareness in the market will need to be fostered. Delivery systems, perhaps through the current system of agricultural stockists, will need to be developed. Further research will be necessary on the identification and development of biological control agents of key pests and pathogens of important horticultural crops in Kenya (and elsewhere) to support these expected trends and to retain small-holders in the sector.
As the evolution of the vegetable cluster and the more recently commissioned CPP projects have shown, the best way to do this will be through public-private sector partnerships.

4.2.6 *Additional targets*

It will be essential to link future research on peat and disease management to efforts in breeding improved varieties of vegetables for resistance/tolerance to major diseases and pests and to efforts to improve seed systems and seed legislation in target countries.

Due to the increasing need for coordination of the diverse projects and initiatives in progress and the growing stakeholder community in the horticulture sector in East Africa, the development of a network in East and Central Africa (under ASARECA) is necessary and timely. It should focus – at least initially - on one sub-sector such as vegetables as a broad horticulture network might be difficult to manage.

Annex 1. Questionnaire

1. What has been your role in vegetable crop protection research projects funded by the CPP?

2. Are you aware of the activities and outputs of the other projects in the vegetable cluster? And if so which?

Impact

3. In your opinion what are the three most important outputs of CPP funded activities in the vegetable sector?

4. Why did you select these outputs?

5. Are there any outputs which you consider to be weak, or a failure?
If so, why?

6. In your opinion what are the three most important achievements within the CPP vegetable cluster (project outputs, institutional, policy, environmental etc)?

7. In your opinion what impact has been achieved by activities funded through the CPP vegetable cluster (product, economic, socio-economic, health, environmental, policy etc)?

8. Are you aware of project outputs still being used beyond the duration of the project/s?

9. Are you aware of any uptake and application of project outputs to/by a) other crops grown by the farmer, b) other farmers not directly involved in the project?

10. How have activities funded through the CPP vegetable cluster directly or indirectly affected the poor?

11. If things could have been done differently how could the impact of the programme have been improved?

Strategy

12. The CPP shifted its strategy in 1998 and 2002. Were you aware of these shifts?

13. How did these shifts affect you and your organisation? What do you feel would have happened without these shifts in strategy? *If you only started receiving funding after 2002 please ignore this question.*

14. In your opinion is the current emphasis on funding promotional projects justified? Please explain your answer if necessary.

15. Do you feel that the promotion of CPP project outputs requires private, public or NGO collaboration as a promotional pathway? Please explain your answer.

16. Do you feel that the CPP is funding an appropriate balance of public, private and NGO promotional pathways? How would you change this and why?

17. Were all appropriate stakeholders involved and/or linked with/to to your project/s? If not, who else should have been involved?

18. Do you feel that the vegetable cluster has established sufficient linkages with other donor initiatives in the areas of:

Crop management?
Small-holder horticulture development?
Horticultural training projects?
Policy initiatives?
Export horticulture?
Any others?

Please explain your answers if appropriate

19. Do you feel that the CPP has influenced other donors in terms of their involvement with the public and/or private horticultural sector?

20. Do you think that the CPP involvement with in the horticultural sector in Kenya is replicable in the horticulture sector in other countries?

Programme Management

21. Have you been satisfied by the project commissioning process (e.g. programme development activities, the development of calls for proposals, the proposal review process)? Please comment.

22. Are you satisfied by the project management process (e.g. monitoring, receiving feedback from the programme team, interactions with the programme staff)?

23. What would you change about the CPP vegetable cluster management and why?

Any other comments

Annex 2. Schedule of visit to Kenya

27/28 November	Travel from UK to Kenya
29 November	Visit to ICIPE (R8297); discussions with Bernhard Lohr and Brigitte Nyambo; visit to Mwea for discussions with Andrew Edewa (graduate) and farmers; return to ICIPE and discussions with 7 additional graduates; dinner with Bernhard and Brigitte
30 November	Visit to Kinale kale seed project (R8312); discussions with project staff and farmers Meeting with Kevin Billing, DFID BSMDP Meeting with Henry Wainwright, Real IPM; travel to Thika
1 December	Visit to Real IPM facilities near Thika; discussions with Louise Labuschagne and Henry Wainwright Meeting with Gilbert Kibata, KARI (R's 6146, 6615, 6616, 7403, 7449)
2 December	Meeting with Sicily Kariuki, FPEAK Meeting with Steve New, USAID HDC Meeting with Simon Maina, Myner Exports Lunch meeting with Lusike Wasilwa, KARI Horticulture Meeting with Sarah Simons, CABI (R's 6615, 6616, 7403, 7472, 7449, 8296, 8299) Meeting with Rod Evans, Homegrown
3 December	Visit to Dudutech, Kingfisher Farm, Naivasha (R8217, 8218); discussions with Henry Limb and Luciano Rovesti
4 December	Meeting with Tiku Shah, Shamit Shah, Sunripe and Gary Bradbury, W Bailey Ltd.
5 December	Travel from Kenya to UK

Annex 3. List of respondents to the questionnaire and key stakeholders contacted in Kenya

List of respondents to the questionnaire

Andy Cherry (NRI) – Project collaborator
Jerry Cooper (NRI) – Project leader
Simon Eden-Green – Programme management
Simon Gowen (University of Reading) – Project leader
Dave Gryzwacz (NRI) – Project leader
Roma Gwynn (Consultant) – Project collaborator
Gilbert Kibata (KARI) – Project collaborator
Louise Labuschagne (Dudutech/Real IPM) – Project leader
Henry Limb/Luciano Rovesti (Dudutech) – Project leader
Bernhard Lohr (ICIPE) – Project collaborator
Brigitte Nyambo (ICIPE) – Project leader
Sarah Simons (CABI) – Project leader
Nicola Spence (HRI/CSL) – Project leader and CPP advisor
Lusike Wasilwa (KARI) – KARI management
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Annex 4. Peri-urban Production System African Vegetable Cluster: Projects and Outputs

Number	Title	Date of completion	Outputs
R6764	Environmentally acceptable crop protection strategies and adoption of IPM strategies by small holder farmers in Zimbabwe	March 2001	Safer spray technologies and methodologies for vegetables developed IPM strategies promoted and disseminated Production and dissemination of 1500 copies of the Integrated Vegetable Pest Management Manual and posters
R7403**	Integrated approach to vegetable pest management to reduce reliance on pesticides in Kenya	March 2002	Improved application techniques (V-lance, nozzles) and methodologies (dosage and efficiency) developed Appropriate and safer pesticides identified * Habitat management for natural enemies explored * Resistant/tolerant varieties identified (kale, tomato) * IPM strategies developed for promotion Production and dissemination of 2500 copies of IPM Calendar
R7449**	Development of biorational brassica IPM in Kenya	March 2002	System of DBM control based on an endemic Kenyan PlxyG virus developed and evaluated Potential for development of a commercial product established and company identified (PM 219) *Need for local, small holder production identified and possible options discussed
R7472**	Integrated management of root-knot nematodes in Kenya	Sept. 2002	Local BCAs isolated, identified, tested, multiplied *Cultural management methods developed e.g. rotation Methods for producing *Pasteuria penetrans* commercially developed and company identified (PM 220) *Methods for producing *Verticillium* under development *Delivery methods for BCAs under development *Integration of cultural methods, resistance and BCAs in process

R7571	Management of viruses diseases of important vegetable crops in Kenya	March 2003	Characterization of variability of major viruses affecting key local vegetables in Kenya esp. TuMV *Identification of virus resistance in kale landraces *Development of virus management strategies (cultural, genetic)

* Indicates that continued research is desirable; ** These projects build on research outputs generated by previously funded CPP projects (see Vision Framework for Peri-urban Production System Purpose 1). All projects have benefited from guidance from R7512 *"Factors affecting the uptake of outputs of crop protection research in Peri-urban systems in Kenya"*.

Figure 1.

Promotion of sustainable approaches for the management of root-knot nematodes on vegetables in Kenya

PERI URBAN PRODUCTION SYSTEM PURPOSE 1: VEGETABLES PROJECT CLUSTER, East Africa

Indicator of Achievement	Pest	Country	pre-95	95	96	97	98	99	00	01	02	03	04	05	Comments/Uptake	A-H
A 101	Weeds	Kenya	None						Review to assess importance and research priorities						KARI-led project as PD study has indicate need for further research	C
A 101	Nematodes	Kenya	None		(Follow-on project from R6611 in Ghana)				R7472: Biocontrol of root knot nematode		R8218 Production of P. penetrans to control RKN	R8296 sustainable RKN management			Promotion and uptake through target institutions and private sector Promotion and uptake through CPP vegetable IPM projects	D-H B
A 101	Insect pests	Kenya	R6146: Pest Mgmt. In Horticultural crops		R6616 : Insect pest management			R7403 Vegetable IPM				PD - Private sector & Livelihoods	R8341 Promotion of IPM		Uptake through KARI, IPM projects in Kenya and Zimbabwe Biorational technologies to be incorporated with other IPM technologies in CPP IPM project and private sector promotion	C E-H
					R6615: Biorationals for insect pest control			R6596: Entomopathogenic nematodes for insect control	R7449: Development of biorationals		R8217 Production of PxGV to control DBM					
A 101	Pathogens	Tanzania	R5447CB: Bacterial Wilt (HP107)		R6520 : Diagnostics for bacterial pathogens										Diagnostic techniques to be taken up through CPP vegetable projects in Kenya & Zimbabwe	D
		Uganda									R8104 Promoting potato seed-tuber management				Promotion of technology by NGOs in Uganda	G/H
											R8106 Promotion of on-farm seed potato production				Promotion of technology by NGOs in Uganda	G/H
A 101	Viruses	Kenya			PD study: assessment of importance and research priorities				R7571: Virus diseases in vegetables			R8312 Production of quality kale seed			Promotion and uptake through CPP vegetable IPM projects Promotion of technologies by target institutions	C G/H
B 101 B 101	Integrated Pest Management	Kenya						PD review of vegetable IPM in East Africa				PD Promotion study			Linkages developed for future vegetable IPM research in Kenya Promotion and uptake through KARI, GTZ IPM Horticulture project, FAO FFS Programme, ICIPE, NGOs, private sector.	G/H
								R7403: Vegetable IPM Kenya				R8299 Farmer Field Schools technologies				
								R7512: Uptake of crop protection research				PD: Biopesticides Workshop				
			DFID NARP I and II: involving KARI and MoALDM									R8297 Private Sector Service Providers				

Key:

- Past CPP projects
- Potential CPP projects
- Current CPP projects
- Related projects

CROP PROTECTION PROGRAMME
PERI URBAN PRODUCTION SYSTEM PURPOSE 1: VEGETABLES PROJECT CLUSTER, West Afric

Indicator of Achievement	Pest	Country	pre-95 / 95 / 96 / 97 / 98 / 99 / 00 / 01 / 02 / 03 / 04 / 05	Comments/Uptake	A-H
A 101	Vegetables Nematodes	Ghana	R5253/4: Fungal and bacterial control RKN; R6611: Biocontrol of root knot nematode; Follow-on work transferred to Kenya project R7472	Uptake and promotion through CPP vegetable projects in Kenya & Zimbabwe	B
A/B 101	Integrated Pest Management	Ghana	R6182CB: IPM Horticulture, Ghana; R6657: IPM Horticulture	Uptake and promotion through CPP vegetable projects in Kenya & Zimbabwe. Project linked with CPHP project R6630	B
			R6630: CPHP Integrated Food Crops Systems		
			R6941 Composting Urban Waste	Project terminated at the end of phase 1; linked with NRSP project R6799	B
			R6799: NRSP Kumasi Natural Resources project		
A/B 101			PD review of vegetable IPM in Ghana	To determine further priorities for vegetable research and uptake pathways	
A/B 101			R7503: IPM and soil fertility management		
		Ghana & Benin	R7960 Public-private development of bioinsecticides	Uptake and promotion through target institutions and private sector	E-H

Key: Past CPP projects; Current CPP projects; Potential CPP projects; Related projects

CROP PROTECTION PROGRAMME

PERI URBAN PRODUCTION SYSTEM PURPOSE 1: VEGETABLES PROJECT CLUSTER, Southern Africa

Indicator of Achievement	Pest	Country	pre-95	95	96	97	98	99	00	01	02	03	04	05	Comments/Uptake	A-H
A+B PU104 With HP114	Vegetables	Zimbabwe	R5368: Pesticide application monitoring			R6764: Pesticide application in Zimbabwe				One year extension completed					Intermediate uptake through CPP vegetable IPM project and related projects in Kenya and Ghana	C/D
	Integrated Pest Management									Workshop/review to identify research priorities					To identify priorities for new vegetable research and uptake pathways	
												Possible new promotion project			Linkages with PPRI, DR&SS for further uptake and promotion	G/H
										CPHP: Projects in vegetable systems						
					R7266: Natural Enemy Field Handbook				R7587	Follow-on: from R7266					Intermediate uptake through CPP vegetable IPM project and related projects in Kenya and Ghana	A-G

Key:

- Past CPP projects
- Potential CPP projects
- Current CPP projects
- Related projects

Annex 5. Achievements and contributions of current CPP vegetable cluster projects

The vegetable cluster has produced a vast and varied number of printed outputs. There are a large number of peer reviewed papers (especially on nematology), field guides, strategy papers, workshops, courses developed and at least 8 PhDs, 3 MScs and 4 BScs.

Current Projects

R8217 - Production of baculovirus to control lepidopteran pests in vegetable crops in peri-urban and rural areas (April 02 - Mar 05)

This project is led by Dudutech with major scientific inputs being provided by: HRI, NRI, Dr Gwynn, KARI. This project is generating knowledge and expertise for the production of a Kenyan baculovirus using its host the diamond back moth (DBM) (Plutella xylostella), a major pest of vegetable crops. The aim is to contribute to the improvement of livelihoods of poor people by improving crop productivity and quality, and reduce the need for agrochemicals (currently used for DBM management). The focus of this project is implementation of the research so a baculovirus production method appropriate to Kenya, an in vivo system, is developed. Stable DBM production through a commercially viable production method has been achieved. In addition Dudutech have found new isolates of PlxyGV, at least one of which appears to have an LD50 lower than the standard strain NYA01.

R8296 - Promotion of sustainable approaches for the management of root-knot nematodes on vegetables in Kenya (April 03-Mar 05)

This project is led by the University of Reading with major collaborations with CABI ARC, KARI, Rothamsted Research and Dudutech. Root Knot Nematode (RKN) is a major pest of horticulture and floriculture crops of importance to local and export production. This project will provide the national regulatory authority with information on biocontrol agents of root-knot nematodes to help enable their registration. The concept of deploying "biological pesticides" is new to Kenya and the national regulatory authority needs evidence of their efficacy and safety. A major objective is to explore the delivery channels for these biological products through the participation of growers and organizations keen to promote their use for the benefit of smallholders. Systems of producing good quality vegetables through the integration of use of biocontrol agents with cultural practices and resistant varieties will be demonstrated and promoted.

Dudutech have refined the production of P. chlamydosporia and are producing 40 kg of formulated product per week; this can be scaled up to 100 kg /week when required. It is planned to commence testing of the P. chlamydosporia on export farms Homegrown) at the beginning of 2005. Large scale production of P. penetrans is still not yet satisfactory. Participatory evaluation has shown that a "new" tomato variety with root-knot nematode resistance was ranked best (of four) including the standard Cal J which is nematode susceptible.

R8297 - Development of private sector service providers for the horticultural industry in Kenya (April 03-Mar 05)

This project is being led by ICIPE with major support from NRI, DFID-BSMDP, Myner Exports, Kenya Horticulture Export Ltd., Greenlands and Indufarm Ltd. Smallholder participation in the Kenya horticultural export industry is threatened by

lack of efficient extension services. This project initiated the establishment of private service providers for advice, input supply and plant protection through hands-on training of service providers to ensure that smallholders can comply with rules and regulations of the trade. The course was advertised in the local media and 254 applications were received out of which 15 were short-listed. A total of 19 (15 applicants plus 4 from collaborating export companies) candidates were trained and 15 graduated. The training curriculum includes extension communication skills and working with farmer groups, vegetable IPM, safe and effective use of pesticides, hygiene standard requirement in fresh produce, business management and preparing farmers for EUREPGAP certification.

The graduates are conducting pre-audits for the EUREPGAP standard and it is likely that the first outgrower groups will achieve certification in December 2004.Links with the DFID funded Business Services Market Development Project (BSMDP) have provided additional funding to cover training in EUREPGAP requirements and control points; QMS internal auditing, and a three-month radio and TV programme on EUREPGAP awareness. Pride Africa is developing a comic booklet to inform farmers on EUREPGAP requirements with technical input from the project leader. A range of income generating options for the service providers are being explored; several participants have set up farm input outlets. Export companies have employed some private service providers. Some have been given short-term consultancies by Horticulture Development Centre (USAID funded) to train farmer groups in EUREPGAP requirements. The service providers have set up and registered Agribusiness & Allied Kenya Ltd for service and advice, thus giving them a legal status to operate. All the graduates are share-holders in the company. The BSMDP supported the establishment of the company and will continue to provide support. The trainees were able to write business plans to secure loans and three of them have begun to repay the loan by instalments.

R8299 - Accelerated uptake and impact of CPP research outputs in Kenya (April 03-Mar 05)

This project is led by CABI, linking with the IFAD Global IPM Facility Farmer Field School Programme and KARI. This project is utilising farmer field schools (FFS) already established in Kenya to provide a 'Fast Track' uptake pathway on vegetable pests and diseases to 5,000 farmers. It calls upon outputs from a wide variety of previous CPP projects. Farmers and FFS facilitators have undertaken priority setting for sweet potato, bean, maize and sorghum crops. The 66 FFS groups are trying out identified IPPM technologies on these crops through weekly FFS sessions. Demand led dissemination materials are being produced and distributed to intermediary organisations. Farmers' assessment of impact and benefits of the new technologies will be documented. Facilitators have been trained on maize, sorghum, groundnut, kale and cassava pest and disease management. Topics included conducting a baseline survey, participatory budgeting and evaluation of IPPM technologies based on farmer criteria. This led to 33 field school facilitators working with 66 field schools to identify priority crops, crop production constraints, conduct agro-ecosystem analysis and identify management options.

R8312 - Promotion of quality vegetable seed in Kenya (April 03-Mar 05)

A project team comprising members of CSL, CABI ARC, HRI, KARI, KEPHIS, Lagrotech have responded to Kenyan vegetable farmers expressing demand for

improved vegetable seed quality. This project aims to promote a sustainable system for farmer-led multiplication of kale seed for smallholder farmers in the Kinale region of peri-urban Kenya, in order to improve the quality, health and availability of kale seed to smallholder farmers. Also the concept and value of producing or purchasing good quality seed will be promoted.

The project has made significant progress in understanding farmers' perceptions and needs with respect to seed purchases and a strong interest from Kinale farmers in multiplying and marketing seed with improved seed health and quality has been expressed. An inventory of brassica seed in Kenya has been drawn up from commercial seed companies and local markets. Significant progress has been made in analysis of Kinale kale as a variety in close collaboration with KEPHIS inspectors. This will give farmers the option to choose registration of the variety in a commercial seed business. Two KEPHIS staff have been trained in testing seed for black rot to ISTA standards at HRI. This was followed up by a KEPHIS/KARI training workshop. Farmers and researchers have selected seven lines from a trial of 24 Kinale kale lines grown on the KARI station at Njabini. The lines are very impressive and will be in demand from farmers in the future. KEPHIS have been evaluating the lines with the research team throughout.

R8341 - Promoting adoption of integrated pest management in vegetable production (Sept 03-Mar 05)
This project is led by NRI, supported in Kenya by the Real IPM Company and links with representatives of many other organisations and companies. This project seeks to complement the promotional efforts of R8297 & R8299. To position it thus it had to understand the foci of these projects and consider what materials would be required to augment these projects and to benefit those trainers of trainers who did not have a FFS or private service provider approach. It has:

1. Conducted a training of trainers course on the promotion of vegetable IPM. 16 IPM Trainers trained and equipped with Trainer Resource Kit
2. 18 cartoons with IPM messages produced in black and white and tinted. Bundled in Manual for Trainers as A4 training tools.
3. Cartoons compiled to a 14 page A3 calendar in English and Swahili - now being printed (2000 copies).
4. Zimbabwe CPP winding road A2 poster and Brassica and Tomato pest and disease A2 poster translated to Swahili and printed (2000 copies).
5. Set of 50 pest, disease and natural enemy flash cards made and printed (16 copies).

ANNEX. 6. Current activities, plans and issues raised by key stakeholders in Kenya

The focus of our meetings with the major stakeholders was to a) identify lessons learnt from the vegetable cluster projects and other activities in the horticulture sector with emphasis on links with the private sector (projects R8297, R8217, R8218) and b) to seek information on current and future trends in the horticulture sector and opportunities for future research inputs.

ICIPE service providers project R 8297

Discussions with ICIPE project staff: Brigitte Nyambo; Bernhard Lohr
The main aim of the project is to train potential private sector service providers (SPs) to build capacity in the export vegetable sector to help small-holder farmers to meet the traceability requirements under EUREPGAP and remain in the sector. The project's main aim is to build sustainable capacity in the sector rather than to train small-holders directly. Through the process of training, the SPs targeted small-holder groups will be certified by AfriCert to be compliant with traceability regulations.

Among the various efforts underway in Kenya to build capacity among small-holder out-growers to be certified compliant with traceability regulations under EUREPGAP, the CPP project with ICIPE is notable for establishing sustainable capacity for current and future services.

This project has been enthusiastically received by the export companies who contributed to the development of the training curriculum and contributed in kind – personnel, time and farms.

If CPP had not funded this project, ICIPE's only other option would have been to build training into existing projects with limited funds. It would have been fragmentary and ad hoc *with limited backstopping after the formal training period – a unique aspect of this project in comparison to other training efforts. In fact, provision of backstopping and feedback from ICIPE (frequently used by the graduates) is like an informal M & E system which could be organized into a formal M&E system if CPP funds a further phase of this project. The comments by Paul Spray in his recent report are therefore timely.*

The project is linked to the DFID Business Services Market Development Project (part of the DFID in-country programme – see later section) – with support from Kevin Billing. This link has been instrumental in expanding the post-formal training period and in linking the training effort into export companies e.g. Myner Exports, Fresh Link and other groups in the sector. It has provided continuity in capacity building and greater potential for the outputs to reach more small-holders during the lifetime of the project and beyond. This link has enhanced the potential for small-holders to achieve compliance with traceability regulations and remain as out-growers in the export sector. From discussions with Kevin Billing, BSMDP will continue to support these linkages.

Thus the contribution from the BSMDP has added value to the CPP project – a rare example of a productive and desirable linkage between the DFID in-country programme and a DFID research programme. The experience has also been a valuable and reproducible two-way learning process which should be a model for future DFID projects.

The concept of this project has now been taken up by other groups/donors which are training trainers and/or farmers to meet the EUREPGAP traceability regulations. These include: HDC, PIP, Real IPM, HCDA, Pride Africa, CARE etc.

The training approach used in the project has stimulated/enabled other groups to provide more sustainable training input into the export horticulture sector in Kenya to ensure that as many

small-holder out-growers as possible can remain in the sector – thus ensuring on-going contributions to reducing poverty and improving livelihoods.

There is an urgent need to coordinate these many, disparate training efforts, some of which are of variable quality. BSMDP are HDC are attempting to provide some co-ordination. A Task Force has been established with PIP funding to foster coordination. This is chaired by Kephis. It is hoped that FPEAK will take on this co-ordinating role with further support from the PIP.

An important concern in achieving traceability compliance with all competent small-holders is the lack of organization within the small-holder component of out-growers for the export sector. Small-holder group formation is the first step; exploring the possibility groups obtaining legal status or even forming companies is the second step; and the third step may be to organize farmer groups on an area basis e.g. within a watershed or an irrigation scheme. This is considered to be the role of HCDA. If such organization can be achieved, this will open up the possibility for area-based EUREPGAP certification which would be far more manageable and far less costly than the current need to certify individual farmer groups.

Currently the export companies hold traceability licences although the small-holder groups are actually certified. With further group empowerment and organization, it would be more appropriate for the farmer groups to hold the licences. Groups will need training in business, administration, micro-financing, conflict resolution etc.

Ongoing efforts will be needed to build the capacity of service providers and train farmers to remain compliant (auditing must be done annually) and to further comply with expected revised regulations and adopt future improved technologies and methods e.g. using natural enemies and biopesticides. Currently, farmers are not fully convinced that they should pay service providers directly as most SPs provide services through export companies. Further discussion and clarity is needed on this issue. It might be easier for export companies to continue to contract the SPs directly but this will not build farmer confidence in paying for good services that enable them to produce superior product and remain competitive in the export sector – one of the ultimate aims of the project.

<u>Discussions with graduate service providers</u>
The first group of 15 trainees graduated in May 2004. With the help of the BSMDP, the group formed the "AGRIBUS" agri-business company and appointed a managing director from amongst them. In addition, all are operating as separate companies; one of these "Today's Agricultural Consultants" has four professionals working in different parts of Kenya. Thus some graduates are already training other professionals and hopefully this will expand. Each graduate was given KSh 40,000 as an agreed loan for start-up capital and some have already begun to refund the loan. SPs provide links between farmers and input stockists (agrochemicals, seed etc.) and can act as guarantors so that farmers can obtain credit from stockists and as negotiators if farmers purchase poor quality inputs. SPs also continue to access a wide range of knowledge sources including internet e.g. PIP monthly update, TV, newspapers etc. Most importantly, they appreciate and use the technical backstopping provided by ICIPE. AS noted, this is a unique aspect of the project which is often not provided by other similar training projects and could be formalised as an M&E system for the project.

<u>Feedback from graduate Andrew Edewa, Consultant to Myner Exporters, in the field in Mwea</u>
The PIP funded Myner Exports to support training to achieve small-holder certification for traceability under EUREPGAP. Myner has field offices staffed by trained personnel in key small-holder out-grower locations. Andrew works with Myner's small-holder groups to develop systems, procedures and infra-structure required to meet the traceability regulations. Record keeping is the responsibility of the Myner field offices. Farmer groups number 30-40

farmers for French bean in Mwea but in Western Kenya, where farmers have less land, there can be as many as 200 farmers in groups growing Asian vegetables.

Andrew noted that it was initially quite difficult to establish systems with the farmer groups. Initially awareness, understanding and trust needed to be grown and it was necessary to work closely with the innovators and early adopters so that the other farmers were convinced.

Thus the service providers learnt valuable lessons about approaches to working with farmers that will be used in future IPM training efforts.

Improvements in on-farm hygiene, IPM systems, good agricultural practices and record keeping were demonstrated by two farmers contracted to Myner. Both farmers were enthusiastic about the improvements and the services provided including the additional product (due to reduced losses) but remain to be convinced of the need to pay SPs directly. Currently it is more secure for the SP to work directly under contract to an export company (some work for several companies). It is probable that SPs will also find more work with NGOs as their reputations grow. There was evidence of spill-overs to neighbouring farmers growing for other companies e.g. adoption of grading sheds and hygiene regulations.

Location of SP's offices in areas of concentration of small-holder out-growers and hubs for export company activities is considered critical for becoming known and getting business. Currently, there is limited competition in such areas but competition is expected to grow as more trained service providers start operating.

As most farmers grow both export and non-export vegetables (due to the need to rotate), adoption of rigorous management systems for French bean to meet traceability regulations spills over to benefit the cultivation of non-export crops such as tomatoes, cabbage, onions etc.

An additional contribution of this project (and that of other similar training efforts) is adoption of sound IPM and good agricultural practices <u>at the farming systems level</u> resulting in overall improvement in system-level product quality and safety – no matter whether non-export vegetables are consumed at household level or traded in domestic markets. This opens up another issue: the need to educate domestic consumers that vegetables from small-holders working in the export sector are higher quality and safer (with minimal pesticide residues) than those grown by small-holders only growing non-export vegetables. Such vegetables should command a price premium in the market. This should be discussed further with supermarkets and other stakeholders).

<u>*Feedback from other graduates*</u>
A roundtable discussion session was organized with 9 graduates from the project who have been working independently for the past 6 months. The graduates gave the following feedback:

1. *the training was very intensive; the practical component very useful;*
2. *continuity of income as a service provider has been difficult; most graduates have sought semi-fulltime to fulltime employment with export and in one case a chemical company and practice consultancies in their free time especially on weekends; companies contracting the services of the consultants include: Greenlands, Green Ventures, Ukilima, East African Growers, Verde Fresh, Myner, Woni, Wamu, Reach the Children, KHE, Sunripe, Fian Green, Veg Pro etc.; the BSMDP has facilitated this process*
3. *the graduates have encouraged farmers who grow both export and non-export vegetables to use improved IPM practices at farming system level for the benefit of the non-export vegetables;*

4. *some key learning experiences have been: the importance of designing realistic business plans, understanding farmers' needs and concerns, market trends (it was noted that daily updates of commodity prices including vegetables are available via mobile phone [service provided by Vodaphone as part of their corporate social responsibility]; they are also published in the Nation) etc.*
5. *the key to retaining small-holders in the export sector is to establish robust quality control and traceability systems; if such systems are in place, exporters are likely to establish contractual agreements with farmers which are necessary to ensure that traceability regulations are met e.g. Myner has contracts with all farmers certified/to be certified for traceability compliance*
6. *although initially sceptical regarding the potential for small-holders to become compliant with traceability regulations, now that the results of various training exercises are clear, graduates and exporters see the advantages of continued involvement of a geographically diverse small-holder base as production is a) less costly; b) less risky; c) viable; it is possible that the small-holder base in the export sector may grow in the future, especially if exporters can deal with farmer groups rather then individual farmers (this should also hold up for the supermarkets)*
7. *the existence of SPs trained under other donor projects is becoming more obvious; some of these have received inferior training which is causing confusion with farmers; graduates are concerned about future competition*

The project has shown that small-holder out-growers for the export sector can adopt traceability systems and sound IPM and agricultural practices required under EUREPGAP and can be certified. Export companies are therefore likely to retain their small-holder out-grower bases (and perhaps even increase the numbers) as continued involvement of a geographically diverse small-holder base is a) less costly and b) less risky.

If the continued involvement of small-holders in the export sector is to be a reality, then compliance with traceability regulations under EUREGAP is fundamental. As the introduction has indicated, more than 200,000 families are have improved livelihoods and are less poor through their involvement in the export sector either as small-holders or employees. The impact of a less viable export horticulture sector and a reduced small-holder base on poverty in Kenya would be serious. Building capacity of service providers who can then train other service providers and build capacity directly with small-holders is a proven approach to supporting the continued involvement of small-holders in the sector and to ensuring that the sector as a whole meets EU regulations. In addition, the service providers approach is likely to reach more small-holders in the short- to medium-term and be less costly than direct training of farmers by a limited number of trainers.

DFID Business Services Market Development Project (BSMDP) – Kevin Billing

The BSMDP was established about a year ago. Its main objective is to stimulate business transactions involving poorer households in a selected number of agricultural sub-sectors e.g. horticulture and dairy. Its outputs are: effective markets for business services and greater inclusion of small-holders and SMEs in the growth channels of selected sub-sectors. Horticulture is one of the key sub-sectors. Given the critical nature of EUREPGAP and its potential to significantly influence the role that export horticulture plays in the sustainable livelihoods of some 200,000 poor families directly involved in the sector (both out-growers and employees), the BSMDP decided to concentrate all of its initial project activities in the export horticulture sector on this issue.

The project aims to create sustainable services providers which will deliver required support to the industry and at the same time help develop the emerging market for these services. By working closely with other donor programmes, the BSMDP adds value for the benefit of the horticulture sub-sector as a whole.

Activities supported by the BSMDP include:

- *apprentices in EUREPGAP and EU-PIP programme compliance programmes (with HDC and PIP);*
- *documentation and information on service providers (with HCDA);*
- *information on the implications of EUREPGAP and the EU MRL regulations;*
- *harmonization of export destination and Kenya in-country regulations with HDC;*
- *support the development and capacitating of relevant industry level associations (with FPEAK, ADHEK, HSPAK, HCDA);*
- *support the development and promotion of small private sector service providers (with R8297 [CPP project]);*
- *support the development of local private sector certification and compliance organizations (with ICIPE through AFRICERT); and*
- *develop and explore the potential of the Product Marketing Organization (PMO) especially to ensure continued growth of involvement of small-holders.*

Linked to R8297, the BSMDP has co-developed a plan with ICIPE to provide support for the business ideas produced by the trained graduates; developed a business start-up programme for the first group of graduates and possibly future graduates; and developed a pilot programme which links graduates and their small business ventures to appropriate financial organizations with repayment guaranteed by contracts especially with exporters (functional) and hopefully with producer groups in future.

This contribution from the BSMDP has added considerable value to the CPP project directly and to an enabling environment to allow the project to accomplish far more than perhaps was originally expected from the project alone. It has also been a valuable and reproducible two-way learning process for ICIPE and the BSMDP which should be a model for future DFID projects.

Due to the growing confusion across the export sector regarding diffuse and multiple donor training efforts for traceability compliance, the BSMDP has taken the initiative to informally coordinate the donors involved including EU PIP, HCDA (various sources), HDC, UNDP, BSMDP, Rockefeller, IFAD, Dutch and AFRICERT. Information on the various training projects is shared.

ICIPE graduates are already linked into a range of activities funded by BSMDP under the above areas e.g. with Reach the Children, Fresh Link and others. BSMDP has the advantage of facilitating linking the various donor activities together to add further value to the training project supported by CPP.

BSMDP feels that the key to facilitating wider uptake of traceability regulations under EUREPGAP by the majority of small-holder out-growers will be to move towards area-based certification systems. This could also facilitate establishment of biological control programmes with natural enemies and biopesticides which may be difficult on small areas normally cultivated by individual farmers.

Dudutech – Henry Limb, General Manger, and Luciano Rovesti, Biorational Development Manger (R8217 & R8218)

Dudutech is a specialist biological control company for research, development and production of biopesticides and natural enemies and training for the horticultural sector in Kenya. It is currently the only company of its kind in Kenya although other export companies are beginning to produce natural enemies for their own use. It is owned by Dickie Evans who also owns Homegrown, a separate company. The Dudutech senior management structure under Henry Limb includes the biorational development manager, Luciano Rovesti, a technical manager for natural enemies, managers for the technical liaison officers and field research and trials and training. Core research on biorationals is done at KEFRI, Muguga

while the commercial laboratory is located on Kingfisher Farm at Naivasha. Natural enemy production facilities have been developed at Naivasha and Timau. The total staff is 190 persons.
Currently the development, testing and use of natural enemies for major pests of key horticultural crops is targeted at Homegrown's own farms. It is likely that Dudutech will sell its products to other companies both in Kenya and possibly overseas in the future (South Africa, Zimbabwe, South American countries, Scandinavia). Dudutech also offers training courses in a wide range of IPM methodologies across the sector but to date, most of the training effort has been directed at Homegrown employees. Homegrown has excellent laboratory facilities for working with biological control agents and developing biopesticides and excellent rearing facilities for mass-production of natural enemies.

From 2002-2004, Dudutech implemented two CPP projects: R8217 – Production of baculovirus to control lepidopteran pests in vegetable crops in peri-urban and rural areas in Kenya and R8218 - Production of Pasteuria penetrans *(Pp) to control root knot nematodes in close collaboration with R8296 – Promotion of sustainable approaches for management of root knot nematodes on vegetables in Kenya. The main aim of R8217 was to develop knowledge and expertise for production and field use of a Kenyan baculovirus for diamond back moth (DBM) to reduce the need to use harmful pesticides in cabbage and other Brassica production. The main aim of R8218 was to develop knowledge of Kenyan isolates of root knot nematode and their parasite Pp in order to use the latter as a biological control agent thus reducing the need to use harmful chemical nematicides in vegetable production.* It is expected that both products will contribute to the improvement of livelihoods of poor farmers by improving crop productivity and quality although initial beneficiaries will be employees working on Homegrown's farms.

Dudutech is gearing up for testing of Pp and the fungal pathogen Pochonia *on experimental field sites in Naivasha and Timau in the near future. Systems for multiplication and formulation of the products are still being developed. Advanced testing of the baculovirus was delayed due to loss of key personnel but testing of the virus on DBM on broccoli is planned in the near future. Dudutech is using an imported spray nozzle from Italy to ensure the virus reaches the underside of broccoli plant leaves where there are more DBM larvae. This suggests that further consideration could be given to reviving the V-lance (developed through previous CPP projects) with Hardi sprayers for application of biocontrol agents. Dudutech is also working with ICIPE on mass-rearing of* Trichogramma *as an egg parasite of DBM. It is likely that both BCAs will be used concurrently in the field to control DBM. A future target for BCAs is likely to be thrips.*

In some crops, Homegrown has successfully replaced pesticides with natural enemies. This has reduced pesticide costs from £100/ha/week to £25/ha/week but the overall cost of IPM is 3% higher than the pure pesticide management system. This does not take into account the health, safety and environmental benefits which are substantial. It is also likely as practitioners become more used to using biological control there will be less need for frequent technical backstopping which should reduce the costs. Due to Dudutech's success on Homegrown farms there are as many as 30 companies wanting to buy Dudutech products but Dudutech will probably only sell to strategically-interlinked companies and not to their competitors.

At the time when the projects were funded (2002), there were no other viable biopesticide companies in Kenya – in fact, the comprehensive activities and facilities of Dudutech are still unique in the sector although some companies have begun to mass-produce natural enemies. Dudutech is the first commercial laboratory to produce BCAs in East Africa. There was and still is no capacity in the public sector. The only other option available to CPP to promote the BCAs of proven efficacy developed by projects supported from 1995-2001 was through on-farm production. However experience from a project producing NPV with an NGO in India

and experience from Cuba indicated the critical need to impose rigorous quality control standards if reliable and effective product was to be produced. After the unsuccessful experience from India, the most reliable option for CPP to promote BCAs in East Africa was considered to be with Dudutech.

The investment by CPP in Dudutech for these two projects was £70K; the investment of Dudutech in developing infra-structure, employing experienced personnel, training staff etc. over the two year period was multiple millions of £s. Dudutech could have funded the work but the driving force was to develop viable public-private sector partnerships, established between Dudutech and the UK-based institutes working on the BCAs: NRI, HRI and the University of Reading. It was unfortunate that a partnership with KARI could not be developed. CPP enabled Dudutech to have access to the BCAs for developing viable promotional systems. Far from subsidizing a commercial operation, CPP benefited greatly from the investment made by Dudutech which added substantial value to the products and greatly increased the likelihood of developing commercial, usable products. Dudutech also took responsibility for the risks of the BCAs not being suitable for commercialisation.

The experience with working with Dudutech has shown that the following model can be used for research and development of biopesticides through public-private sector partnerships: core research by the public sector; applied and adaptive research and development through public-private sector partnership; then commercialisation by the private sector. This is likely to be the least costly and time-consuming approach for successfully producing biopesticides in Kenya. It is expected that biopesticides will contribute to the improvement of livelihoods of poor farmers by improving crop productivity and quality. However how to ensure that small-holders benefit from using biopesticides still remains to be resolved.

Henry Limb is not in favour of providing biopesticides and natural enemies to small-holders as past experience in building capacity to use biological control with small-holders has not been successful and the time investments will be considerable. It took Dudutech 3 years to establish successful and manageable natural enemy control systems on Homegrown's farms. Even now, the technical liaison officers provide on-going back-up support. In addition, there are currently no delivery systems. *Perhaps the best option will be to train trainers such as those being trained for capacity building in traceability regulations who will then work with small-holders growing for export companies.* Clearly this issue needs further assessment and discussion.

Dudutech has registered all of its natural enemy products through the complex and expensive pesticides registration process as until 2003 there appeared to be no possibility of registering them as biopesticides. The pioneering Kenyan Biopesticides Registration Workshop supported by CPP in June 2003 paved the way to commercial biocontrol in Kenya. An international forum of pesticide registration experts from the EU guided the Kenyans in developing user-friendly Legal Notices for registration of natural enemies and biopesticides which is awaiting passage through parliament. Once operational it will enable registration of biopesticides in Kenya by local and importing companies. In fact, several South African companies are currently testing biopesticides in Kenya in anticipation of approval of the legislation. Competition from imported biopesticides may stimulate growth in the local market and provide a wider range of products for farmers.

If the two BCAs developed by CPP projects are successfully developed into biopesticides they will have to be registered. It is not clear who will pay for this – CPP, DFID or Dudutech? If the biopesticides are not registered they can still be used on Homegrown farms but will not be available for use by the sector and, more importantly, will not available to small-holders. If DFID and CPP paid for part or all of the registration costs, agreement could be reached on development of delivery systems and product to small-holders. Another consideration is that biopesticides are not likely to be cheaper than pesticides, at least in the short term.

The most important achievement of these projects is considered to be the development of appropriate and effective biological control agents into commercial products to the benefit of the horticulture sector as a whole. Sustainable promotion and uptake would have been impossible without the involvement of Dudutech. The CPP support for Dudutech enabled the transformation of research into reality. The strategy was sound and the right choice was made. However, as Paul Spray emphasized: the priority now is to develop delivery and application systems so that small-holders across the sector can benefit.

Real IPM – Louise Labuschagne and Henry Wainwright

Real IPM was established by its directors in 2003 as a premier training and IPM problem-solving consultancy company. One director, Louise Labuschagne, led the two CPP projects (R8217 and R8218) on development of biopesticides with Dudutech during 2002-2003. Once their facilities are established near Thika, Real IPM also plans to mass-produce and sell natural enemies for key pests affecting horticultural crops in Kenya and elsewhere. The initial focus will be on pests of protected roses through use of Phytoseiulus *and* Encarsia. *The directors have the experience and skills to design and direct research that identifies solutions to growers' problems. Based on their growing client base, Real IPM will make an increasingly important contribution to fostering and facilitating the use of biological control solutions in the export horticultural sector in Kenya in the future.* This will no doubt lead to the growth of other companies in the sector where biological control solutions are likely to dominate future crop protection activities.

Fully functional, Real IPM will be able to supply natural enemies such as Phytoseiulus *for red spider mite control in roses for approx. 6 ha of protected production per week. Currently, protected rose production in Kenya is approx. 1000 ha and increasing.* As it will be impossible for one company to meet the growing demands of the sector, it is likely that the pioneering effort by Real IPM will attract additional companies. *Already some export companies (in addition to Homegrown – see below) are establishing their own natural enemy mass-rearing facilities e.g. Sunripe, East African Growers, Veg Pro etc.*

Both Louise Labuschagne and Henry Wainwright emphasized the critical and urgent need for further support by DFID (and other donors) for on-going research on identification and development of biological control agents of key pests and pathogens of important horticultural crops in Kenya (and elsewhere). As the evolution of the vegetable cluster and more recently commissioned CPP projects have shown, the best way to do this will be through public-private sector partnerships.

Currently, the use of natural enemies and biological control agents/biopesticides in the horticultural sector is in its infancy. Problems of delivery and application are still being resolved and systems refined for use in protected crops and companies own farms. A critical need in the future will be to develop delivery systems for small-holder out-growers. Louise Labuschagne suggested that one option might be to bring into operation the 10 HCDA collection depots located throughout the export horticulture production areas. These facilities have infra-structure including cold stores for holding and distribution and, perhaps, production of natural enemies and biopesticides. Emerging plans (facilitated by the BSMDP) to develop area-based traceability compliant systems may help to make the use of biological control on small-holder farms a reality. This is an area where donor support is urgently needed through DFID and possibly the PIP Small-holder Project.

Horticulture Development Centre (FINTRAC) funded by USAID – Steve New

The HDC is a USAID-funded programme managed by the agri-business firm Fintrac Inc. Its mission is to increase and sustain small-holder sales and incomes through crop diversification, improvements in production and post-harvest technologies, and market

linkages. It works with both the export and non-export small-holders. It concentrates its resources in a number of areas including:

- *EUREPGAP: HDC is working with a number of partners (including ICIPE's AFRICERT) to help small-holders to comply with EUREPGAP requirements and remain in the export sector – small-holders currently supply 60% of Kenyan exports to the EU; it is working with HCDA to develop a national public-private sector strategy for EUREPGAP certification of small-holders *. HDC estimates that it will cost approx. $25 million to certify all of the most capable small-holders involved in the sector however the EU PIP has already spent millions of Euros on training for the large and medium-sized export companies so it may cost much more than $25 million. Both USAID and FAO have registered concerns about the cost of this training effort. Results to date suggest that small-holders can meet the strict regulations; the main problem is organizational capacity which is slowly being improved through group formation*

  * The need for improved coordination of all of the various training efforts being implemented across the sector to achieve traceability compliance is paramount. HDC is working with BSMDP and FPEAK to compile a donor list working in this area to help keep all informed. PIP is funding a Task Force that should take on this role.

- *local market fruit and vegetables: working with partners to analyse local market supply chains and identify opportunities to improve them;* analysis to date shows that the demand for fruit and vegetables in the domestic sector is growing and current supply cannot meet the demand especially for some fruit commodities

- *passion fruit: currently the demand for passion fruit both export and domestic for fresh fruit and processed juice is far greater than the supply – hence there are good opportunities for small-holders (it is mainly a small holder crop) to adopt this commodity and generate cash income;* with considerable pest, disease and management problems to resolve, increased production of passion fruit provides future research opportunities

- *chilli products: there is a growing demand for fresh chillies in the export sector and most is grown by small-holders;* again there are pest and disease problems that warrant further research to the benefit of small-holders

- *small-holder flowers: although most of the common flowers such as roses and carnations are grown by large capital intensive growers (under protected plastic houses), others such as* Eryngium, Ammi Majus, Alstromeria, *Moby Dick*, Arabicum *and* Molucela *are grown mostly by small-holders; the export and domestic small-holder market is worth approx. $10 million annually;* there may be opportunities for research on pests and diseases on these flowers to keep small-holders in the sector

- *tree crops: including avocado, mango, etc. are largely small-holder crops and* considerable effort is needed to improve crop production including managing pests and diseases, crop post harvest handling, *cottage processing, group mobilization and marketing; again there are opportunities and need for research* – probably some of the outputs from previous DFID/CPP projects on managing diseases and pests of these crops in other geographically regions e.g. Caribbean, Asia may be relevant to helping to resolve the problems in Kenya; *in particular, Kenya could produce higher quality and more tasty avocados that will compete well with other fruits being sold in Europe*

HDC feels that the best ways for Kenya to remain competitive in the export sector include:

- *focussing on labour rather than capital intensive systems*
- *focussing on perennials to reduce overall costs of production*

- *focussing on high value/unit area crops e.g. fruit and flowers*
- *focussing on less perishable commodities e.g. some fruit, spices – which opens up the possibility of sea transport*
- *establishing good market information systems*
- *diversifying cropping systems – currently the export sector relies heavily on three crops: roses, French beans and avocados*

We discussed future use of biological control and biopesticides by small-holders. HDC noted that companies that produce such products in Kenya may not necessarily be the best entities to promote products to small-holders – this reinforces the need for a study of delivery and application systems which will benefit small-holders. Steve New recommended that future research efforts should work with FPEAK which are now far more active, capable and representative of all stakeholders in the industry

Steve New recommended that the most exciting opportunities for small-holders in both the export and non-export horticulture sectors in Kenya in the near future are in fruit for both the fresh and processed (juice) sectors and possibly, traditional leafy vegetables. As the commonly grown fruits e.g. passion fruit, mango, avocado etc. have complex and serious disease and pest problems, there are good opportunities for crop protection research to improve both quality and productivity. The importance of diseases and pests on leafy vegetables (other than kale) will need further study.

Despite concerns that EUREPGAP and traceability issues could be a threat to small-holder incomes from involvement in the export sector, HDC reports that overall fresh horticultural exports from Kenya increased by 22% in the first 8 months of 2004. If this trend continues, total earnings of small-holders from export horticulture will reach $36 million – an increase of $6 million over 2003.

With more and more small-holders becoming compliant with traceability regulations and the need for export companies to continue to rely on them for produce (reduces costs and risk); the small-holder base of the export sector is likely to continue to grow with additional benefits to the Kenyan economy and to small-holder livelihoods. It is therefore important that the sector continues to have research back-up to address problems such as pests and diseases that reduce product quality and production which reduce Kenya's competitiveness and threaten the livelihoods of small-holders and employees in the export sector.

Export horticulture companies

Myner Exports

Simon Maina, Managing Director, Myner Exports is fully committed to building capacity within his small-holder out-grower base to achieve compliance with EUREPGAP traceability regulations. Myner has received support from the PIP and has also paid for additional training. Myner exports French beans and snow peas. Seven farmer groups will be certified by May 2005. Myner has 7 technical staff including Andrew Edewa (trained through the CPP ICIPE service providers project) who work closely with the farmers in the field. Unlike some export companies e.g. Homegrown, Myner issues small-holders with contracts which guarantees that Myner will reap the benefits of the training investment in small-holders and fully comply with traceability requirements. Contracts benefit both small-holders and companies.

Simon Maina is convinced that within 3-4 years most export crops will reach EUREPGAP standards in Kenya. This is likely to make Kenyan consumers more aware of food safety issues to the extent that improved standards will be demanded for domestic fruit and vegetables. The large supermarkets are already discussing ways to source fresh fruit and vegetables with reduced pesticide residues. It is likely that the improved agricultural practices

imposed by EU traceability regulations will ultimately benefit the whole horticultural sector in Kenya.

All of the export companies noted that they have lost trained technical staff to other companies which, although temporarily difficult to manage, is seen as good for the industry as more staff are then trained.

Simon Maina supports the move towards replacing pesticide use with natural enemies and biopesticides but noted that they must be affordable and preferably cheaper then chemicals, which are now very expensive. This move will also allow more companies to enter the organic production although Sunripe (see below) indicated disincentive for exporting organic produce to the UK.

Homegrown
Homegrown is the largest export company in Kenya exporting flowers, especially roses, and vegetables, especially French beans, to the UK and other European countries. It has a small-holder base of 1013 farmers supporting approximately 5000 dependents. All French bean production is by small-holders to reduce cost and risk. Some small-holders have been growing French beans for Homegrown for 20 years. It also employs 9000 workers on its own farms supporting approximately 45,000 dependents. There is also considerable but unquantified spill-over to neighbours and friends of the small-holder and employee bases. Its contribution to reducing poverty in Kenya is therefore considerable.

Homegrown has 40 trained technical assistants backstopping the small-holder out-grower base. The technical assistants regularly work with farmers to update knowledge and production methods with obvious spill-overs to the other vegetables grown for the domestic market. Homegrown has already achieved traceability compliance under EUREPGAP and is now moving towards achieving the more rigorous Tesco's Natures Choice. Homegrown has received support from the PIP to build the capacity of trainers and small-holders. It is now developing an electronic record keeping system for traceability through the use of hand-held computers in the field. Rod Evans, Director of Homegrown, noted that export companies would not spend so much time building capacity of small-holders if they were not so committed for them to be retained as out-growers. *Interestingly, Homegrown will not establish contracts with its small-holder out-growers as some other export companies are doing.*

It is hoped that when most export companies have been certified under EUREPGAP that FPEAK will take the responsibility for co-ordinating annual auditing for fruit and vegetables and the KFC for flowers.

All exported vegetables are processed and packaged prior to export as this adds value and reduces the percentage of transportation costs per unit of value. For example, the weekly production of French beans by small holders for Homegrown is 60 t of which 40 t is finally exported after processing. Homegrown exports 320 t of vegetables and flowers to Europe every night – equivalent to one full jumbo jet.

Rod Evans considers that the development and use of natural enemies and biopesticides is crucial for the future competitive edge of the export sector in Kenya, especially against Morocco and Egypt which enjoy cheaper freight costs. Currently in Homegrown the major pests of protected roses are largely managed by natural enemies. Once Dudutech has developed robust application systems, soil pathogens in Homegrown's own farms will be managed with biopesticides including products produced from the two CPP projects.

Although the capacity of Homegrown's small-holder farmers to adopt Good Agricultural Practices (GAP), including sound IPM systems, to meet traceability regulations has now been

built, Homegrown does not plan to develop natural enemy and biopesticide management systems on small-holder farms. It is hoped that through use of sound IPM systems, natural enemies will establish naturally on small-holder farms but this is yet to be proven. Again, this reinforces the urgent need for further study of the options for delivering biological control options to small-holders in order to ensure their continued involvement in the export sector (as noted above).

Sunripe
We met briefly with Tiku Shah and Shamit Shah, Directors of Sunripe, and Gary Bradbury, Crop Technologist with Baileys, based in the UK, to discuss probable developments in the export horticulture sector in Kenya in the next 5 years.

There is increasing competition in the export sector for Kenya, especially for vegetables e.g. French beans from Morocco and Egypt and for some fruit e.g. passion fruit from Ecuador and mango from Asia. Kenya will need to diversify its crop base to remain competitive, possibly moving into spice production e.g. ginger which can be transported by sea and/or seeking new markets e.g. Middle East, Asia etc. It is likely that flower production will continue to grow as Kenya is very competitive. There is also opportunity to exploit Kenya's comparative advantage in avocado production (produces tasty quality fruit compared to competitors such as Spain). Both spices and avocado are largely small-holder crops and the base of small-holders involved in flower production is growing. It was suggested that future crop protection research should focus on pests and diseases of these crops.

It was noted that although production of organic produce for export was once seen as a profitable area, the UK has imposed local authority inspection on any organic produce arriving from outside the EU at a cost of £45-£145 per lot. Although this produce meets the traceability regulations under EUREPGAP, it must undergo further inspection. The fee is charged without inspection due to the lack of inspectors. This is considered to be an unfair tariff barrier by Sunripe and is a disincentive for Kenyan export companies to become involved in organic production.

Use of biopesticides and natural enemies will become more common in the export sector in future especially for protected crops. Biological control agents (BCAs) and natural enemies already identified and proven to control major pests such as leaf miner and red spider might will be increasingly used and new products will be needed as expected further restrictions on the use of chemicals are imposed. Additional training will be needed on the use of BCAs. Awareness in the market will need to be fostered. Delivery systems perhaps through the current system of agricultural stockists will need to be developed. Further research will be necessary to support these expected trends.

It was noted that FPEAK is now functioning well after a slow start. Additional companies are joining. FPEAK is now actively engaging with the companies to address problems with regulations and issues related to regional trade (with the ETI). HCDA is also functioning better after an overhaul of the management and the board. This is very positive for the continued growth of the export sector in Kenya.

FPEAK
FPEAK is functioning well. Its membership numbers 55 members with additional companies joining (estimated to be about 70 regular export companies operating). These include the top 13 companies exporting about 80% of product from Kenya. FPEAK is now actively engaging with the problems of the export companies and supports the industry to comply with international standards.

Sicily Kariuki, Chief Executive, strongly endorsed CPP's decision to work with the export vegetable sector and to support public-private sector partnerships through a number of

projects for the development of biopesticides. She views FPEAK as the appropriate channel to disseminate information to the export companies but research and development should be done with specific companies.

Sicily predicts continued investments and growth in the export sector for fruit, vegetables and flowers. Market diversification will be very important – to SE Asia, Middle East, USA to avoid potential European duties when Kenya loses its least developed country status in 2008 and will be required to pay tariffs of 7-15% on exported product. However the final decision has not yet been made as there are serious concerns that this imposed tariff will cause instability in the region and affect emerging regional trade opportunities.

Key issues that the export horticulture sector will have to address in the near future:

- *reduce costs of production*
- *become fully compliant with international standards – PIP support was invaluable but there is still more to be accomplished across the sector*
- *reduce freight costs – perhaps by moving to sea transportation for less perishable commodities*
- *market diversification*
- *reduction in brief case exporters (estimated to be more than 300 operating in the sector) who cannot comply with international standards*

Key issues that will affect the continued involvement of small-holders in the export sector and make the whole sector more stable:

- *capacity building in quality assurance systems and efficiency*
- *farmer group organization*
- *development of contracts between small-holders and export companies to ensure compliance with traceability standards*
- *product diversification to keep small-holders in the sector*
- *basic investment in infra-structure to meet international standards*

Experienced private sector providers will be very important to the sector in future.

KARI

Discussions with Lusike Wasilwa, Horticulture Department, KARI HQ

Lusike Wasilwa works closely with Mary Wambule, Head of the Horticulture Department in KARI. Lusike indicated that KARI will give higher priority to horticulture in future. Attempts will be made to re-build the scientific capacity. For example, KARI is organizing an international horticulture conference in 2005 which will improve the profile and importance of horticulture in KARI. Twelve centres will be established in the major horticulture areas to reassess the key constraints to vegetable production which will feed into a priority setting exercise. The focus will be on tomatoes, cabbage and French beans. Another area of interest is passion fruit – a small-holder crop with important disease and pests problems. KARI also plans to work on problems of traditional leafy vegetables to take advantage of the growing trend in their consumption.

There is already growing interest among small-holder farmers in using botanicals e.g. commercial neem products are available. It is likely that biopesticide products will be used when available provided they are affordable.

It is also likely that KARI will look for opportunities to work with the private sector in future.

A secretariat of representatives from the Ministry of Agriculture has been set up at KARI HQ to build linkages between KARI and the ministry.

Discussions with Gilbert Kibata, Pest Management Department

Gilbert Kibata was a key entomologist involved in many of the CPP projects implemented in the vegetable cluster from 1995 to 2001 (prior to changes in strategy to work with the private sector). In addition to his response to the questionnaire, Gilbert Kibata's further observations on lessons learnt from the vegetable cluster projects were sought. He made the following points:

- *the original projects implemented in the vegetable cluster (1995-1998) were to some extent supply-driven, lacked necessary linkages (both with DFID and within the cluster), and lacked understanding of promotional needs**

  * The supply driven nature was partly due to the mis-match in the timing of the DFID in-country needs assessment for the NARP which was not done until 1996, a year after the RNRRS was initiated. However in spite of this and in hindsight, the decision by the CPP to focus on potential biological control solutions to major pest problems of vegetables was a sound decision which will now contribute to meeting the increasingly restrictive regulations on pesticide use. The lack of functional links between NARP and the CPP was a serious on-going concern that could not be resolved by CPP alone in spite of their efforts. CPP's decision to create a vegetable cluster of projects in East Africa in 1998 and DFID's decision to revise the research programme logframes to place more emphasis on promotion in the final stages of the strategy helped to address some of these concerns post-1998.

- *as reflected in several of the respondents to the questionnaire, the decision by CPP to work with the private sector was considered abrupt and disruptive by several public sector partners involved in the earlier cluster projects; according to them, CPP could have handled the transition more sensitively**

  * Although KARI was included as a partner on the projects contracted to Dudutech (R8217 and R8218), CPP possibly did not realize that the development of such a novel partnership needed more facilitation to build trust among the partners. Thus the opportunity to form a public-private partnership with KARI within these projects was lost. The important lesson learnt is that greater facilitated dialogue is needed between potential public and private sector partners when the institutes and companies involved have not worked together before. Dudutech indicated the importance of working with KARI in future research projects focussed on developing biological control agents. Thus, the private sector is willing to work with the public sector and under the new KAP, KARI is increasingly more willing to assess the opportunities. In contrast, sustainable partnerships between ICIPE and private sector partners in R8297 were formed without problems. As ICIPE has a history of working with the private sector in Kenya, the partnership was easily formed.

- The development of biopesticides legislation in Kenya was a major achievement of the CPP: Legal Notices are now before the parliament and it is hoped that the legislation will soon be approved. *Biopesticide companies in South Africa are already testing several biopesticide products in Kenya in preparation for registration and sale in Kenya. Although these will compete with local production, it is expected that competition will drive further development of the local sector (as discussed above).*
- *exchanges between researchers working on similar vegetable crop protection projects in Kenya and Zimbabwe were considered useful and should be part of future projects*
- there is a need for a vegetable network to bring the various stakeholders and activities together in a more coordinated way

CABI

Discussions with Sarah Simons, Director of Research, CABI-ARC, Kenya

As the key pathologist involved in many of the CPP projects implemented in the vegetable cluster from 1995 to 2001 (prior to changes in strategy to work with the private sector), Sarah Simon's further observations on lessons learnt from the vegetable cluster projects were sought, in addition to her responses to the questionnaire. She made the following points:

- three year projects for developing IPM systems in small-holder vegetable production systems are not realistic; there is need for a 10 year vision framework with planned activities within such a timeframe; flexibility is also needed to bring in additional partners as need arises; a sound M&E system should be part of projects

- *the abrupt decision to work with the private sector for promotion of BCAs was poorly handled and broke-up national partnerships; time was lost due to the need for Dudutech to repeat work already completed on previous projects*

- *Other uptake pathways should have been considered such as on-farm production and promotion through FFS such as the IFAD FFS involved in R8299 – Accelerated uptake and impact of CPP Research Outputs in Kenya.*

It would be useful to compare different uptake pathways for IPM technologies of different levels of complexity as there are clearly diverse and contrasting opinions as to what is possible with small-holder farmers.

We also discussed future crop protection priorities in the horticulture sector in East Africa. As most fruit such as avocado, mango and nuts such as cashew are grown by small-holders, a future focus on the serious pest and disease problems affecting these crops would be useful. It would also be useful to transfer proven technologies to other countries and geographical regions.

It was agreed that the development of a horticulture network in East and Central Africa would be useful for coordinating the diverse and numerous research efforts. It should focus on one sub-sector such as vegetables as a horticulture network would be too broad and difficult to manage. It would be useful to learn from recent networks set-up under ASARECA e.g. for coffee, sorghum and millet etc. whose development was delayed by teething problems (now resolved).

Annex 7. Documents consulted

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